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THE CHEMIST;

/// a monthly journal of chemical & physical science

(OR,

REPORTER OF CHEMICAL DISCOVERIES AND IMPROVEMENTS,)

AND

(PROTECTOR OF THE RIGHTS OF THE CHEMIST AND CHEMICAL MANUFCTURER.)

EDITED BY

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AND

JOHN WATT, JUN.

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INTRODUCTION.

WE have now completed the first volume of THE CHEMIST, and terminated our labors for the year. We shall take a brief survey of the progress which the work has made, and of the advancement of the several branches of science, of which it is the record.

That it has shared the usual fate of all works of the kind—that it has roused the envy of rival journals—and that it has been the subject of futile attempts to injure it, and retard its acquirement of public estimation—is no more than might be expected. THE CHEMIST, however, has had more than these to struggle with and to defeat: worthlessness, knavery, pitiable ignorance, and deception in parties who should have assisted us in our undertaking, but who took upon themselves that which they have left us to perform; together with the feeble efforts of contemporary malignity. Such means as have been adopted for the purpose of crushing our work, had they come from ordinary sources, would have excited no wonder; but when it is stated that the engine of our attempted destruction was a *Magazine of Philosophy*—it may cause some surprise.

In the first of these cases, we had an easy alternative, that of adding, to the labor and responsibility of editing, the whole expences of the journal from the commencement to the present time, which we cheerfully undertook, from the firmest conviction of the ultimate success of our labors; and with every hope of rendering it, from time to time, still more deserving of public favor.

In the latter case, added to our most ineffable contempt, so far from succumbing, as doubtless it was hoped we should have done, to the unworthy stratagems of our opponents, we were only the more resolved to exert all our endeavours to render every number of the work still more perfect.

Our triumph has been most complete; and THE CHEMIST has now arrived at a sale, far exceeding our most sanguine anticipations; and we have received, we hope not undeservedly, the most unqualified approbation of men of science, and the more enlightened journals, which is far from being the ordinary lot of works of this nature; and it has established itself—"*Per varios casus, per tot discrimina rerum.*"

The want of a journal expressly devoted to CHEMISTRY, CHEMICAL MANUFACTURES and PHARMACY, has long been felt; there is not one which can be considered as at all adapted for the chemical reader. There are, it is true, some few miscellaneous works, containing articles in various sciences and arts, and one or two others, composed of dull and heavy subjects of abstruse calculation, written expressly for those journals, and which seem as if they were intended to gratify the inclination of their authors for displaying their profundity, and to limit the number of their readers. These works form no record of chemical science, which should consist of all that occurs within the period of publication. It was to supply this deficiency that THE CHEMIST has been established, and every pains has been taken to keep it in the closest conformity with its object.

In each number of our work, since its first appearance, will be found detailed descriptions of every thing worthy of note, in Chemistry, Chemical Manufactures and Pharmacy, which has taken place in this country, and on the continent; so far, at least, as the limits of our space would admit. —In the earlier numbers we have given full, and very minute details concerning the brilliant discovery of Daguerre; and the more recent improvements in the manipulation of the process, and its application to practical purposes in the arts. We have also given many excellent methods of preparing the photogenic papers.

To mention all the articles most worthy of notice, would occupy a space far exceeding that which we have allotted to these introductory remarks: we may, however, notice some of them. We wish that we could boast more English and fewer foreign names among the authors whose luminous articles adorn the pages of this volume, and we hope that next year, when our increase of size will much augment the labor of editing, our scientific readers will more freely contribute papers in the various branches of science embraced by The Chemist.

In the department of Chemistry, we have given, in addition to articles from our own pen, and selections from the English scientific journals, faithful translations of such of the memoirs read before the continental academies of sciences as our space would admit of, together with many very valuable articles from various foreign scientific periodicals. Among these we may name, as of high interest:—"On the means of distinguishing Vegetable Alkalies by Chlorine, and by the Sulphocyanide of Potassium," by M. Lepage: "Researches on the Chemical Action which the Metallic Salts exert on Liquid Albumen and on Certain Tissues of the Animal Economy," by M. Lassaigne: M. Berzelius on Tartaric Acid; Knapp on the Formation of Emetic; "On the phenomena of Calefaction," by M. Boutigny. M. Kuhlmann has also furnished to the chemical reader some very interesting papers, namely, those concerning the properties of finely divided and spongy platinum, and his—"Contributions to the history of alcohol, pyroxylic spirit, and ethers." M. Becquerel, long known to our readers as a chemist of great eminence, has also this year contributed much to science, in his investigations concerning electricity: he figures, also, among the inventors of photogenic papers. M. Laurent, likewise, is among those whose names most frequently occur in the present volume; his researches in organic chemistry have been attended with curious and very interesting results. M. Deschamp's paper on rennet is of a very important nature, and well worthy of an attentive perusal. Berzelius's paper on the composition of bile, is also one of the most important items in the summary of the transactions of the year. The names of Pelouze, Dumas, Rose, and Girardin, Hess, Vogel, Fritzche, Persoz, Penny, Johnson, Johnston, Troost, Gmelin, Thomson (Professor T.), Azaïs, Planche, Soubeiran, Capitaine (the two latter very frequently in connection), Erdmann, Malaguti, Melsens, Deville, Arago, Daguerre, Schönbein, Schafhæutl, Mohr, Couërbe, Liebig, and many others, too numerous to mention, have this year made their appearance in The Chemist. Next year, we hope to be able to give a long list of English contributors.

In the department of Chemical Manufactures, we have also to express our obligation to our continental brethren for their many signal improvements in the various branches of industry, and chemistry applied to the arts. Chevreul's investigations concerning dyeing are of great interest, and of much practical value. M. Bontemps has also added to our information concerning the manufacture of flint and crown glass. In this division we have given numerous photographic, photogenic, and electrotype discoveries, processes and improvements; modes of detecting various adulterations; Professor Delarive's process for gilding metals by electro-chemical action, without the use of mercury. A Memoir, by M. Boucherie, on the preservation of wood, is well worthy of the attention of all classes of readers, as detailing some interesting and highly useful facts. Various processes for manufacturing lighting gas, and, among others, those of M. Selligue, have been given. We are indebted to MM. Girardin, Preisser, Osmin Hervy and Colin, for well directed investigations concerning the coloring matter of the *Polygonum Tinctorium*, and for various excellent practical methods of extracting it; to MM. H. Reinsch, Girardin and Preisser, for useful and very valuable information concerning the refined cashoo of commerce, and its adulteration; to M. Becquerel for a paper entitled—"General Considerations on the Application of the Physico-Chemical Sciences to the Natural Sciences, to the Arts, and Manufactures;" to Mr. Pellatt, for a concise and detailed description of the manufacture of flint glass; and to Mr. Dircks, for an article on gamboge. We may also mention, as of high interest, a paper on Bleaching Powder, by Mr. MUSPRATT, and one on the Formation of Acetic Acid, by Mr. JULLION. Many others there are, also highly deserving of notice, if our limits would permit us to enumerate them.

In the department of PHARMACY the list of articles is so long that we can mention but very few. Dr. St. Ange's Memoir on *Monesia*, or, as it is now more properly called, *Buranhem*, gives an account of the wonderful properties of that medicine, and of the miraculous cures effected by means of it and its various preparations. Among these we may mention cases of leucorrhœa, menorrhagia, diarrhœa, hœmoptysis, scurvy, chronic bronchitis, scrofula, syphilitic affections, &c., &c.; in these cases the extract was administered internally: the monesia ointment also was completely successful in the removal of ulcers. As with all other new and much vaunted medicines, monesia was tried after every other remedial measure had failed.

The efficacy of the hydrated peroxide of iron as an antidote for arsenic has been fully and satisfactorily proved, and we have from time to time given instances in which its success has been undoubted. We earnestly recommend chemists and druggists always to keep this useful antidote in their shops. Dr. Spaetr has found the hydrated peroxide of iron efficacious as an antidote for Scheele's green (arseniate of copper).

The various ferruginous preparations have this year risen still higher in estimation: we have given numerous new formulæ for them in our journal. Lactate of iron, administered in the form of lozenges, has been found very advantageous in chlorosis, &c. We are also indebted to M. Louradour for a process for making this useful medicine, and for means of detecting the adulterations to which it is liable.

Vaccination, although strictly speaking more a medical than a pharmaceutical subject, has been treated of. M. Sedillot has endeavoured to prove that revaccination is quite unnecessary.

We have given many cases of poisoning by various toxical substances, together with the antidotal measures successfully adopted in those cases. The statistics of poisoning show a frightful amount of persons who had died in the years 1837 and 1838 from poison, accidentally taken, wilfully administered, and taken by many for the purpose of flying the troubles of this world, and swallowed during intoxication, lunacy, passion, and despair. Communications from very sensible correspondents on the sale of poisons, have at various times made their appearance in this work.

Something surely might be done to diminish this melancholy sacrifice of human life.

Many formulæ for new medicines, and new methods of preparing old ones, have found a place in our columns: these are so numerous that we can only thus generally allude to them.

M. Orfila's investigations concerning the presence and natural existence of arsenic in the human bones, as detailed in his Memoirs on this subject, have the highest claim on our attention. His high standing as a toxicologist, and as a chemist, give a deservedly great weight to his opinions. We have also laid before our readers his Memoirs on poisoning by antimonial and cupreous preparations, which, doubtless, have been read with infinite delight by men of science. M. Orfila has demonstrated the natural existence of copper in man, a fact, which Signor Cattanei, in an article of which we have inserted a translation, has endeavoured to disprove, his experiments having led to a negative result. It has been proved that copper naturally exists in many natural products.

Marsh's apparatus for detecting minute portions of arsenic has been found of very great utility in medico-legal investigations. In the case of Madame Laffarge, who, a short time ago, was tried for poisoning her husband, it enabled M. Orfila to detect arsenic in the body of the poisoned man, although several chemists, who used it for the same purpose, obtained only a negative result,—a circumstance for which M. Orfila very satisfactorily accounted.

We thank those who have contributed towards filling the columns of THE CHEMIST. Among our most useful and sensible correspondents, we may rank Mr. MACKAY, of Edinburgh, whose communications we always feel great pleasure in receiving.

In conclusion, we cannot but feel the highest gratification at the very flattering reception of the work, and its rapid and continued advance in public estimation; and these are our best rewards for the unceasing efforts we have made to render it deserving of the support it has received. In the change we find it necessary to make, a still more enlarged opportunity of increasing its claims on the public approbation will be afforded us. The sphere of its usefulness will be greatly extended, as, by augmenting its size, we shall be enabled to introduce the higher subjects of chemistry—to give insertion to many very valuable foreign Memoirs which we have been constrained to lay aside for the present—to supply much original matter, and to give a far greater variety of topics—so that, in fact, no scientific journal of the day, at more than double the price, will yield an equal quantity or variety of information of the highest order. No expense shall be spared—nor means neglected to render THE CHEMIST more and more useful from number to number. From every source which the labors of our own country, France, Germany, &c., will afford, will be selected the most important additions to our knowledge of those sciences which form the subjects of THE CHEMIST.

To the above we shall, from time to time, add such original articles on chemistry and its application to the arts, as long experience—unremitting study and research—and the most extended opportunities of observation and investigation, have afforded us in all chemical subjects. Our vigilance will ever be on the alert to impart knowledge, and our labors will ever be exerted to execute our arduous, but pleasing engagement with the public, to the fullest extent of our ability, hoping to derive the satisfaction of knowing that our exertions have not been made in vain.

THE CHEMIST.

ADVERTISEMENT.

That the objects which this Journal embraces, viz. those of reporting, from time to time, the various discoveries and improvements in Chemistry, Chemical Manufactures and Pharmacy, and those of protecting the rights of the Chemist, the Chemical Manufacturer and the Druggist, as well as the interests of the Public, from the schemes of ignorance and imposture, are of the most vital importance to every class of society, will be admitted by all who are competent to judge of such subjects.

It is proposed, therefore, to arrange the Papers which the work contains, under the three distinct heads of—Chemistry,—Chemical Manufactures,—and Pharmacy; and, under each head, to give a full and satisfactory account of all discoveries and improvements made during each month.

The endeavour to protect the interests of the Chemist will naturally blend itself with the articles, whether original papers or abstracts, in which they are involved. The time, assuredly, is one at which this is urgently called for, both in relation to manufactures and to medicine.

We may take, for example, the case of the scientific chemist, who in the course of his labours has been successful in the improvement of some art or process founded in chemistry. What are at present his hopes of remuneration? They are dependent either on the protection which can be obtained by patent, or on the chance of the process being kept secret from workmen and competitors.

If he obtain a patent, he is left to the "forlorn hope" of discovering any infringement; and even if assured of its existence, he is without the prospect of obtaining evidence to prove it, so as to gain legal redress. In recourse to law, he has little chance of any result but the loss of his money.

In an attempt to carry out his improvement without patent, how is he situated? Can he expect to keep the process from the eyes of the men employed, and consequently from being generally known, when a few shillings would purchase all that they know? Every one who understands these matters, is well aware of the reply which must be given.

In order, therefore, better to protect these parties, we seek to arouse them to an earnest attention to their own interests, by making some determined efforts to obtain from the legislature amendments in the patent laws. This, we are convinced, would best be accomplished by the establishment of a board of scientific men, whose duty it should be, to judge of all patents before they are granted, and by adopting the rule that, when once passed, they should be held secure throughout the whole of their term, and not be rendered void by any subsequent act. This would have the effect of keeping out of the office all worthless patents, and of securing protection to those that are valuable.

In connection with this, we must here take notice of persons trafficking in chemical processes, a class by no means small, who either under delusion themselves, or hoping to delude others, attempt to foist upon manufacturers and others, processes of various kinds, frequently too ridiculous to deserve any grave consideration, yet often with a success so enormous as to astonish any reflecting mind. We could enumerate some recent instances of this kind, which exceed all that is known in quackery; and, like the latter, they seem to succeed in the exact ratio of their worthlessness, so far as the extortion of money from the ignorant is concerned.

In order to protect the manufacturer and capitalist, as well as the abler chemists and inventors, our Journal will contain a brief review of chemical patents specified within the month, so as to lay before the public the real merits they may possess.

We may now allude to the interests of the retail chemist, the compounder and dispenser of the products of pharmacy; and we deplore that, notwithstanding many brilliant and honourable exceptions, in too many instances his state of knowledge is defective. Too often he can do little more than combine products purchased, at the cheapest possible rate, of some wholesale druggist, without being at all able to determine the goodness or badness of any one thing he is called upon to dispense. Here, therefore, the health of patients may be sacrificed to ignorance of the quality of the drug, or incapacity to detect by experience the correct combination of the chemical to be employed.

The retail chemist ought, therefore, to be compelled to undergo a strict examination as to his knowledge of the nature of drugs and their medical properties, so as to enable him to detect any error in prescription, and insure his committing no mistake through ignorance. It will then be seen that, even in this department, the patient is in the hands of a man of scientific attainments, who can at once detect the unchemical nature of any prescription, and who will be amenable for the due performance and exercise of his calling.

The retail chemist, however, is out of his province, in attempting either to discriminate the diagnostic signs of disease, or to prescribe for them. Strange to tell, such is the absurd anomaly of our institutions, that though the chemist's knowledge of the healing art is supposed to be good at home, yet the moment he puts his foot out of doors, and dares to administer in the most trifling case, that instant he subjects himself to the degradation of lengthened imprisonment and heavy fine.

We must next notice the interference of the apothecary with the chemist. There is not, perhaps, a single class of tradesmen who are so ill-regulated, or we should rather say, who are so entirely without regulation, as apothecaries. Out of every fifty now practising as surgeons and apothecaries, not more perhaps than one-fifth have passed the College of Surgeons. They mostly keep open shops, as they are generally of humble origin and scanty means, in order to benefit by that which ought to be left to the chemist entirely, and thus they have every opportunity to practise surgery as well as medicine, there being no legal check, and no one being empowered to detect them. Thus do they act in total defiance of all law relating to the government of medical practice, to the injury of the better educated part of the profession, and to the imminent danger of public health.

The Apothecaries' Act, which is to expire this year, will leave, if due provisions be not made, still greater licence than now exists. It is greatly to be hoped, therefore, that some act will be brought in to secure the public from the gross ignorance, quackery and extortion of these men, who are now allowed to drench their credulous patients, and empty their purses. Such disgraceful practice requires an immediate remedy.

This remedy is to be effected both by an act assigning to apothecaries a particular rank in the profession, and by making it imperative on them to obtain a respectable classical and scientific education, which would infuse into them some portion of liberality. The mode of remuneration for the apothecary should be by a regulated scale of fees for attendance ; and he should be allowed neither to send in medicine, nor to sell by retail.

While, then, we advocate restrictive laws against the chemist, we advocate them against the medical practitioner, giving to each his peculiar province. The present system of cramming patients with medicine in order solely to pay the medical man for his time and attention, calls aloud for the interference of parliament. Separate the province of the chemist from that of the practitioner, and the remedy is at hand. The practitioner has no longer for remuneration to look to the number of the draughts he supplies; but, as his advice and time are his stock in trade, and as his knowledge has been acquired by the investment of capital, he should be paid the interest thereof by the only legitimate mode, viz. charges for the continued supply of his professional skill and experience, without being subjected to the degrading alternative of remunerating himself at the expense of the health and comfort of his patients.

It is a lamentable fact also, that grocers, tallow-chandlers, tailors, and, in short, any person, are allowed to deal openly in articles denominated drugs. This fact is followed by one still worse: the articles generally supplied to these persons are of the most impure or damaged kind, and are sold at a corresponding rate. It not unfrequently happens, for instance, that carbonate of soda (sesquicarbonate) sold by such persons, is principally plaster of Paris (sulphate of lime), a very cheap insoluble substance, always liable to lodge in the bowels, and thereby produce inflammation ; and such articles as senna, rhubarb, and the like, have generally been damaged by salt water or otherwise. They are sold cheap, and the public seem satisfied. A number, however, of sudden and premature deaths probably result from suffering unqualified persons to vend such articles.

We recommend to the more enlightened Members of Parliament to bring in the long-proposed Medical Bill, and to engraft thereon the opinions we have now expressed; and when we say *we*, we speak for thousands of our professional brethren. Let there be placed on the Statute-book a law by which the practitioner may receive, otherwise than at present, the price of *his* advice and attendance; the chemist, that of *his* knowledge and experience in the preparation of all medicinal compounds; assigning also to each his peculiar province, and preventing the sale of all chemicals and drugs except by those regularly trained to the profession, whose knowledge shall be tested by the strictest examination.

At the time when any Act of the Legislature is passed for the regulation of medical practice, it will be the duty of Parliament to appoint a Board of Inspectors of Medicine, whose province it ought to be to visit, examine and report, the qualities of the drugs and chemicals of medical men and chemists, condemning such as are bad, and fining those chemists who employ them. These officers ought also to be empowered to take cognizance of all abuses throughout the profession, and particularly as regards the exercising of such portions of it as the parties are not qualified to practice.

We have carefully perused the Specifications of all Patents occurring within the month, and have found none of sufficient importance to demand any remark, as we felt no great reliance on the practicability or efficiency of the various processes they detail.

We regret that the list of the prices of Drugs, with their tretts, tares and duties, is, by the misconduct of the party employed to collect such information, too late for the present Number: such omission shall not occur again.

I. CHEMISTRY.

ON THE DIRECT COMBINATION OF OXYGEN WITH ATMOSPHERIC AIR, FORMING THE BINOXIDE OF AZOTE, OR NITROUS GAS, BY THE TRANSMISSION OF THESE GASES THROUGH A PORCELAIN TUBE HEATED TO BRIGHT REDNESS.

BY CHARLES WATT.

It has long been well known to chemists, as long indeed as the discovery of the composition of nitric acid by Cavendish, that oxygen and azote do not unite when, in their gaseous state, and under the ordinary circumstances of temperature, &c., they are exposed to mutual contact in the proportions in which they are found to exist when separated by analysis from each other, viz. $(n + 2\,O)$ i. e. azote 1·14; oxygen 2·16; and that therefore, the binoxide of azote cannot be formed except by the action of nitric acid upon some of the more oxidable metals.

The only means formerly known of causing their combination were those employed by Cavendish in the year 1785, and published in the Philosophical Transactions, which were the mixture of these gases in a glass vessel, in the proportions of 3 volumes azote and 7 volumes oxygen, and the passing of electric shocks repeatedly through them. The Rev. J. Milner subsequently found that, when ammonia is passed over black oxide of manganese raised to a red heat in a porcelain tube, the ammonia is decomposed, and water, nitrous acid and nitrate of ammonia are formed.

No other means of forming a direct combination of these gases have as yet been established, and it is evident that their affinity under ordinary circumstances is very slight.

Conceiving that these gases may be made to combine, and thus serve many practical purposes of importance in the arts, I employed the following process and apparatus. I filled two bladders, one with atmospheric air, and another with oxygen, each of them having attached a long and slender glass tube fixed into one end of a porcelain tube, which passed through a furnace in which was maintained a heat just sufficient to preserve the tube of a uniform redness. To the same end of the tube was attached another little apparatus for generating steam if required, as I conceived might be the case in the course of the experiment, if nitric acid were likely to be produced, that being known to be always combined with water or hydrogen. I next made gentle pressure upon each of the bladders for a few seconds, so as to cause some of the atmospheric air and oxygen to pass off into the tube; and the results were evidences of nitrous oxide both as to odour, and the redness of its fumes, by the contact of the atmosphere or of oxygen, while passing out of the end of the tube left free (namely, the opposite extremity to that having the apparatus fixed to it), and likewise the acid properties it gave to water into which it was transmitted. As often as the pressure on the bladders was resumed, so often did these evidences return; and they were much increased by the admission at the same time into the tube of small quantities of steam or of pure hydrogen.

I have often repeated these experiments, and always with like results. I shall repeat them with many additions, and give the results in future Numbers of this Journal.

I may here add, that I have long been of opinion that nitric acid is a triple compound of oxygen, azote and hydrogen, and that it does not exist in water in a state of combination or solution, which is commonly asserted in books, as well as that nitrous acid is the point of oxidation of azote (azote 1, oxygen 4), at which the combination of these gases stops, unless hydrogen be added; and that addition enables the azote to unite further, i. e. with five proportions of oxygen (azote 1, oxygen 5) which are known to exist in nitric acid.

MEMORANDUM ON THE INTENSITY OF REFLECTED LIGHT AND HEAT.

BY PROF. FORBES.*

At the meeting of the Society on the 4th of February, I remarked, on the occasion of Professor Kelland's paper on the intensity of reflected light, that it was almost without a parallel in science, that a quantitative physical law like that of the intensity of the reflection of light at different angles, should have first been divined by the rare sagacity of Fresnel, and confirmed by the very different but elaborate mathematical investigations which Mr. Green of Cambridge and Professor Kelland have applied to the subject, whilst scarcely any attempt has been made towards its verification by direct experiment.

Some critical cases for polarized light were indeed assumed as the basis of the original formula; and M. Arago has confirmed it by one or two intermediate photometrical experiments; but the chief evidence for the truth of this remarkable law rests on the indirect observation of the change of the plane of polarization of an incident ray after reflection.

It occurred to me, about the end of 1837, that the anomalies of photometrical observations being nearly as unsatisfactory as ever, some light might be thrown upon this important subject by ascertaining the law in the case of heat, the intensity of which we have no difficulty in measuring. And since the discovery in the case of heat, of refraction, single and double, of polarization, of total reflection, and the change it produces on polarized light, as well as the change of the plane of polarization by simple reflection, there seems the greatest reason to suppose that the laws of reflection for heat and light, if not identical for both, would be connected by some simple analogy.

Accordingly, during the month of December 1837, I made some preliminary observations, which encouraged me to proceed. It appears to me, from those observations, that the quantity of heat reflected from different transparent bodies is independent, or nearly so, of the nature of the source of heat, and the diathermancy of the reflecting body, and that at 55° of incidence the intensity of reflected heat is nearly that which Fresnel's theory gives. The substances, however, were not all prepared so as wholly to exclude the action of second surfaces.

I have this winter resumed the subject. I have had an apparatus constructed for securing sufficient accuracy in determining the angle of incidence, and I have used reflecting surfaces, both transparent and metallic: the former are wedges of plate-glass, by means of which reflection from the first surface only may be observed, and the latter are plane specula of steel and silver. The prosecution, however, of these apparently simple experiments has been attended with unforeseen difficulties; and although the relative proportions of heat at different angles of incidence are now pretty well determined for glass in several cases, I am not prepared to say whether the absolute amount is exactly the same as Fresnel's formula would give, assigning to heat its proper refractive index. It is satisfactory, however, to know, that the approximation to it is much greater than direct photometrical measures have yet given, with the single exception of two experiments of M. Arago already referred to; and that I have reason to believe that the experimental law which Mr. Potter has given from direct observation in the case of light, represents my results much less accurately than the theory of Fresnel.

With respect to reflection at the metals, I believe I may assert that I have verified the remark of Mr. Potter, that metallic reflection is *less* intense at the higher angles of incidence. I have attempted to ascertain whether it reaches a minimum, and then increases up to 90° of incidence, as Mr. Maccullagh supposes, but I have not obtained decisive results. The quantity of heat reflected by the metals is so much greater than Mr. Potter's estimate for light, as to lead me to suspect that his photometric ratios are all too small, which would nearly account for their deviation from Fresnel's law.

The most complete verification of Fresnel's law would be found in observations made on heat polarized in opposite planes. These I have attempted, and, so far as they go, they seem to confirm the analogies of heat and light. But the intensity is so much reduced in the process of polarizing, that I fear we must wait for yet more delicate instruments to measure it. In the mean time I may state the method which I propose to employ.

When heat is polarized by transmission through inclined mica plates, the polarization is *incomplete;* but if the plates be inclined at the polarizing angle, the transmitted heat is undoubtedly composed of a portion p polarized (in a plane which we will call $+$), and a portion $1-p$ unpolarized. This latter part philosophers are content to consider as compounded of a part $\frac{1-p}{2}$ polarized $+$, and an equal part polarized $-$. Now, let the intensity of reflected heat polarized in the plane of reflection (or $-$), and that perpendicular to it

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* From the *Proceedings of the Royal Society of Edinburgh*, March 18, 1839.

(or +), be represented by the following table, which contains the quantities to be *found.*

TABLE I.

Incidence.	Reflected Rays Polarized.	
	+	—
0°	a_0	b_0
10	a_1	b_1
20	a_2	b_2
&c.	&c.	&c.

Also let the quantities of heat actually *observed* to be reflected after *incomplete* polarization by passing through a mica bundle, be the following:

TABLE II.

Incidence.	Polarizing Plane of Mica bundle.	
	+	—
0°	A_0	B_0
10	A_1	B_1
20	A_2	B_2
&c.	&c.	&c.

Now, the quantities A and B will be thus composed: the quantity of heat transmitted by the mica bundle and incident on the reflecting surface contains, when the plane of polarization is perpendicular to the plane of reflection, a portion of heat $p + \frac{1-p}{2}$ polarized +, and a portion of heat $\frac{1-p}{2}$ polarized —; let these quantities be m and n; then $m + n = 1$. Now, let the plane of polarization be turned round 90°; then the part polarized in the plane of reflection will now be m, and that perpendicular n. So that the heat is first composed of a part m reflected according to the law of a in Table I., and a part n reflected according to the law of b; and then the converse; so that

$$A_q = m\,a_q + n\,b_q$$
$$B_q = n\,a_q + m\,b_q$$

Hence $A_q + B_q = a_q + b_q$, as it evidently ought, and

$$A_q - B_q = (m - n)(a_q - b_q)$$

Hence *the differences of the columns in Table II. are in a constant ratio to the differences of the columns in Table I.;* and as Table I. may be computed from Fresnel's formulæ

$$\frac{\tan^2(i - i')}{\tan^2(i + i')}, \text{ and } \frac{\sin^2(i - i')}{\sin^2(i + i')}$$

the agreement or discrepancy will be apparent, and the coefficient $(m - n)$ will indicate the polarizing power of the plates. Also, since the sum of the numbers will be the same for both tables, a single comparison would suffice to determine the index of refraction, which must be assumed in computing the first table.

NEW AND EASY METHOD OF GENERATING CHLORINE GAS.

BY CHARLES WATT.

It may not be generally known to our readers, that chlorine gas may be generated in a very easy manner, and in a pure state, by means of chloride of sodium (salt), nitric acid, and some metallic oxides.

The process and the quantities of each substance which I employ, are as follows.—Some chloride of sodium is put into as much water as will dissolve it. A sixth part of nitric acid, and as much black oxide of manganese or peroxide of lead (minium), is next added. A gentle heat is then applied to the vessel, when the gas passes over in great abundance, and is very pure.

The chief advantage of this method is, that there is no sudden and violent action, nor any chance of breaking the vessel, which is the case when sulphuric acid is used.

LENZ'S REMARKS ON CERTAIN POINTS IN THE DOCTRINE OF GALVANISM.*

IT may be recorded as one of those profoundly incomprehensible facts, which in physics continually occur, that a class of phenomena, such as those of galvanism, should, during a period of forty years, have been subjected to the observation of the most subtle experimentalists, among whose names are to be found the most distinguished; and that, with respect to the particular source of such phenomena, we are even now as much in the dark as at first. Indeed after Volta abnegated, by means of his celebrated pile, the existence of the cause of these phenomena in animated organization, and presumed them to arise from directly opposite sources, the opinions of the speculative, upon the particular seat of the so called electro-motive power of the galvanic circuit, became divided; and the earlier doctrine ascribed this power to the contact of heterogeneous conductors; while the other sought it in the chemical action of the fluids upon the solids which are in contact with them. At the present moment, the latter chemical theory of galvanism is supported by distinguished advocates; as, for instance, Faraday, De la Rive, Becquerel, &c., although again each of these, in the detail of his views, differs from the others. If, however, my own patient investigations and numerous and varied experiments have led me to embrace Volta's earlier theory, the weight of such names imposes it upon me as a duty, not to bring forward my own views until they are found to be sufficiently clear to afford definite conclusions. Hitherto, it has appeared to me to be especially necessary to be enabled accurately to ascertain the force of the stream at each instant, and on each experiment, a proposition of the practicability of which I have perfectly satisfied myself by means of the Multiplier of M. Nervander Von Helsingfors. My first endeavour was therefore to procure a similar instrument, and the most perfect of its kind, in which I have not yet succeeded for want of a proper material.

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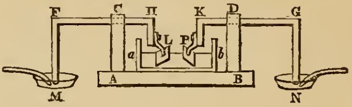
* From *Annalen der Physik*, von J. C. Poggendorff, Leipzig, 1839.

I have discovered, by means of many experiments, that all kinds of native copper act upon the magnets of other multipliers, although by chemical test I could discover no trace of the presence of iron. These experiments, as well as those of others, have convinced me that copper is slightly magnetic—or, if we follow the lately expressed opinion of Faraday—that the ordinary temperature of about 15° R. is not sufficiently high to deprive copper of its magnetism. Unwilling longer to delay my experiments, there remained to me no alternative but to choose such metal as exhibited in the least degree this counteracting power; and this I found to be brass. The apparatus constructed of this material bids fair to answer the desired end, as far as may be judged by the effect upon a simple needle. On account of its great flexibility, I have chosen silver for the winding wire, and as soon as I shall have concluded a course of trials of this apparatus, I will commence my experiments, and shall not fail to communicate the results to the academy: and, in the meantime, I will, *in limine*, bring under consideration certain points, which although lightly held, in the estimation of the defenders of the chemical theory, at least justify us in not falling unconditionally into their views.

In the first place, I will speak of the *resistance to transition* which the galvanic stream encounters on passing from a fluid to a metal, or from a metal to a fluid. This *resistance* was first treated of by Fechner, although it had been also observed by others. As this resistance has been, in some quarters, denied to exist, I here beg permission to prove its existence, by other means than those adopted by Fechner to the same end; and I trust that my experiments will leave no doubt of its existence. For this purpose I employed the apparatus, by means of which I have, in many treatises, exhibited the influence exerted by the conducting wire on the passing stream. I raised the magnetic stream in a spiral which surrounded the cylindrical magnet, and obtained thereby a stream of a constant magnetic power, which could be estimated by the needle. But in these trials, instead of bringing the circuit into the wire, too susceptible with regard to its conducting power, this was done only with the apparatus represented by the annexed diagram, in which A B represents a board with two vertical columns, AC and BD. Through the latter the copper wires are bent, MFH and NGK, as in the figure, and the points H and K are made to approach each other at pleasure, as are also L and P, which are metal plates of an inch square screwed on this part. The latter are in a glass vessel *ab*. The ends, FM and GN, of the copper wires, dip into small mercury caps, and come out with the end of the multiplier and the spiral. By now bringing the plates L and P in contact, and passing the stream through the apparatus, we may be readily convinced that the force of the stream is equal, what metal soever we employ.



Having convinced himself of this, let the operator place the plates again at a distance from each other, say of a line; then let him pour into the vessel a conducting fluid, and compare the force of the stream raised in the spiral by the employment of plates of platina, with that produced when copper plates are substituted; and the stream in the latter case will be found the more powerful, as the needle will indicate a bias of 47°, while in the former the result will be only 9°.

Thus, in these experiments, all the circumstances are known; the susceptibility of solid conductors, that of fluids, the removal of the plates, their surfaces, &c., &c.: and there exists between them only the distinction that the stream in one case passed from platina to a fluid, and from the latter to platina again; while in the other it passed from copper to a fluid, and thence again to copper. Hence there is only a distinction in the passage from the metal to the fluid; and as this produces a difference so sensible in the power of the stream, there must necessarily be a resistance in platina much more marked than in copper.

Similar experiments are available, in determining precisely the amount of this resistance with regard to that of the conducting fluid; or that of the solid conductors in the circuit. For this purpose it is only necessary to operate with each double plate at two distinct distances. Let these distances be d' and d'', the resistance of the solid conductor 1, that of transition λ, that of the fluid at the distance $= 1 - l$, and by taking, as Fechner has done, the resistance proportionable to the distance of the plates, if a, a', and a'' represent the half of the angle of deviation of the multiplying needle, for the distance d, and for the distance d'', consequent terms for l and λ may readily be found.

$$l = \frac{2.\ \sin.\ a, \cos.\ \frac{1}{2}\ (a' + a'').\ \sin.\ \frac{1}{2}\ (a' - a'')}{(d'' - d')\ \sin. a'.\ \sin.\ a''}$$

$$\lambda = \frac{\sin.\ a}{\sin.\ a'} - 1 - d'\ l.$$

I have instituted some preliminary experiments, and have found that platina, in diluted acid, offers a resistance about twenty times greater than that of copper with acid: I have, however, not yet reduced these experiments to that nicety at which I hope in time to arrive. The resistance undergoes a marked change, during immersion in the acid, and it is this circumstance which renders the calculations difficult. Another class of experiments tried the independence of this resistance, of the strength of the acid—on the transition of the stream from copper to water, I discovered the resistance to be—with

2 per cent. acid . . . = 90093·2
4 — . . . . = 51848·9
6 — . . . . = 26627·2

taking as the unit the resistance to the conducting power of a copper wire of one inch long and three-quarters of a line in diameter. Although these numbers are not to be considered perfectly accurate, they leave no doubt of the proposition, that the resistances of transition bear an unlimited relation to the chemical effect of the fluids, and the metals in contact with them; a principle which coincides perfectly with Fechner's earlier researches. Thus there exists a cause which operates to the effect that the stream of a galvanic circuit increases with the chemical effect of its elements, and the source of the generated electricity may be charged at will: thus the fact of the force of the stream being independent of the chemical action is no proof in favour of a chemical view of the excitation of electricity; as the resistance of transition, which constitutes by far the greater part of the collective resistance of the circuit, satisfactorily shows, that by employing pure water and sulphuric acid the stream is insignificant, but it becomes very powerful on the substitution of diluted acid; and the principle is unquestionably the greater chemical action, not necessarily by the increase of the electro-motive power, but by the diminution of the resistance.

This leads us to another point deserving of consideration in determining the value of both theories; and especially important in the subject of galvanic streams. I have in another place expressed myself more at length, and shown how prejudicial has been the want of due attention to the conducting powers of various metals. I may here allude to the view taken by Ohm, which describes the stream in a very simple formula:

$$F = \frac{A}{L}$$

in which F represents the force of the stream, A the amount of the collective electro-motive powers, and L the sum of the collective resistances of the conductng powers. Abundant observations and my own researches, through magneto-electric induction, prove the accuracy of this formula, while the stream passes only through solid conductors. The observations of Fechner have been equally conclusive with regard to the hydro-electric chain, although the precision may not be so striking, in consequence of the subtlety of the phenomenon. The rejection of this simple proposition has produced innumerable errors in the conclusions drawn from experiments. I may instance Becquerel's view; he, with his galvanic chain, may produce strong chemical action, but not the phenomena of heat. His apparatus is composed of acid, kali, and platina (Poggen. Ann., vol. xxxvii, p. 433). The explanations may be as follows: Let the electro-motive power, which produces the stream in Becquerel's apparatus, = A; leaving it undetermined where the seat of this power is to be found. The resistance which the conductors oppose to the stream consists of three individual minor resistances; that of the connecting wires (= L); that of the fluid (= l); and that of the transition (= λ) from the platina to the acid and the kali. The stream is expressed by this formula;

$$F = \frac{A}{L + l + \lambda}$$

In this L is estimated little beyond 0, in consequence of the proportionally great conducting powers of the metals; l, in like manner, is of considerably less value than λ, since between the plates and the fluid no chemical action arises. This premised, we will assume (as according to Becquerel) that instead of L another wire of n times smaller diameter is introduced into the chain, by which means this almost infinitely small portion of the denominator becomes n times increased, which produces nothing equivalent to any diminution in the denominator, nor, consequently, in the stream; hence then the multiplier does not affect the declination of the needle. Becquerel increased the surface of the platina n times, thus diminishing n times a great portion of the denominator, as the resistance of transition bears inverse proportion to the surface; F becomes thus almost n times increased, and it follows that the evolution of gas, which is proportionable to the stream, was charged in the same relation as the immersed surfaces of the plates of platina. But that the evolution of heat in the thin platina wire was = 0, arose from the weakness of the stream : indeed in an apparatus very similar to that of Becquerel, in which the evolution of gas was considerable, the multiplier declared a diversion of only 22°, the stream not being much weakened : of this I convinced myself by the introduction of a second wire, the resistance of which was nearly equal to that of the multiplier. We have been accustomed to consider the evolution of gas as the consequence of a powerful stream, because in making the experiment, a considerable column is necessary. But this only takes place because there is required a stream capable of overcoming a considerable resistance within the column, and the denominator increases in denoting the power of the stream, therefore F is accordingly diminished.

Another point, which has been long known but not duly considered, is the change to which metals are subjected in respect of electro-motion (be it with regard to each other in the Voltaic, or with regard to the fluid of the chemical theory) when immersed in fluid. From a series of experiments, instituted with the above-mentioned apparatus of Becquerel, I am led to believe that I have arrived at the fact, that the effect upon this modifying influence of the acid and the alkali depends upon the plates of platina, and not upon the chemical operation of the fluids. In the meantime, as the proof is not yet sufficiently satisfactory to me, I will proceed no farther with the subject until the next communication, especially as this circumstance carries us far into the debate on the two views, a position which I would, if possible, avoid.

NOTE ON CHLOROSULPHURIC ACID.

BY M. V. REGNAULT.

In my first investigations respecting chlorosulphuric acid, I had not succeeded in obtaining that compound pure by the direct combination of chlorine and sulphurous acid. Flasks, filled with a mixture of the two gases, had remained exposed to the sun for several days, without the least alteration being observable. The sun was probably not sufficiently intense at the period of making these experiments ; it was the month of September ; but afterwards, by means of the great heat which we had in the month of June, I was more fortunate. Flasks, filled with a mixture of chlorine and sulphurous acid very dry, being exposed to the direct rays of the sun, exhibited, after some days' isolation, a white vapour, which became condensed in little drops on the sides. The quantity of liquid produced was increased on the subsequent days, so that it became easy to get it out of the flasks. The combination of the whole of the mixed gases was not, however, determined ; it is probable that their affinity ceases when they have arrived at a certain state of rarefaction.

Five flasks, of the capacity of 20 litres, gave me 20 gr. of chlorosulphuric liquid. I purified it by distilling it on mercury, and rejecting the first portions which contained dissolved sulphurous acid.

I verified on this liquid some of the results which I had obtained in my first effort on the liquid mixed with Dutch oil.

The density of the liquid was found to be 4·659 at 20° ; its boiling point about 77°. The density of its vapour was found to be 1·665. The calculated density is 4·652.

ON SULPHATE OF CHLORIDE OF SULPHUR.*

BY H. ROSE.

Some attempts which were made to convert the sulphate of chloride of sulphur, $\mathrm{S}\,\underline{\mathrm{Cl}}^3+5\dddot{\mathrm{S}}$, by taking sulphuric acid from it, into a compound analogous to the chromate of chloride of chromium, $\mathrm{Cr}\,\underline{\mathrm{Cl}}^3+2\dddot{\mathrm{Cr}}$, did not yield satisfactory results.

If chloride of sodium be treated with sulphate of chloride of sulphur, they unite to form a solid transparent mass, which does not emit fumes, but which when heated yields a vapour having a strong smell of chlorine, and which nevertheless is undecomposed sulphate of chloride of sulphur, containing free chlorine. If it be submitted to distillation, the latter escapes as soon as ebullition occurs. By the decomposition of the chloride of sodium sulphurous acid is eventually disengaged, and there remains a mixture of super-sulphate of soda and undecomposed chloride of sodium.

The sulphate of chloride of sodium [sulphur ?] decomposes at a temperature much above its boiling point. If the vapour be conveyed through a glass tube heated to redness, chlorine gas as well as sulphurous acid are evolved, but the presence of the latter is not discoverable on account of that of the former. The liquid obtained, after numerous researches into its nature, appeared to be a solution of anhydrous sulphuric acid in sulphate of chloride of sulphur, in which the first partly crystallizes by cooling. It is not possible to procure by this process, a definite compound of chloride of sulphur and sulphuric acid.

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* *L'Institut*, Août 1839.

The specific gravity of the vapour of sulphate of chloride of sulphur, was found by a mean of five trials to be 4·481. Supposing it to be a compound of 6 volumes of chlorine representing 3 double atoms, and 2 volumes of vapour of sulphur, corresponding to 6 atoms, and 15 volumes of oxygen, the calculated density would be 44·489 or 10 × 4·489. This result agrees well with the experiments, when it is considered that in this compound 23 volumes are condensed into 10. Each atom of the compound corresponds to 10 volumes of vapour.

M. Walter has proposed to consider the chromate of chloride of chromium as a chromic acid, in which an atom of oxygen is replaced by an equivalent of chlorine. If this view be applied to the sulphate of chloride of sulphur, it would also be a sulphuric acid, in which half an atom of oxygen is replaced by half a double atom of chlorine. In this case the compound would contain $\frac{1}{2}$ a volume of sulphur, 1 volume of chlorine, and $2\frac{1}{2}$ volumes of oxygen. and the calculated density of its vapour would be 7·414. In this case a very peculiar condensation must be supposed to occur, and yet the numbers would not agree with the experiment; from which it must be concluded, that the sulphate of chloride of sulphur, as it has hitherto been termed, is a compound of sulphate and of a chloride of sulphur which has not yet been isolated.

The sulphate of chloride of sulphur may be prepared by a much more simple process than that hitherto employed: it is effected by mixing chloride of sulphur with good Nordhausen sulphuric acid, and submitting the mixture to distillation with a gentle heat. It is thus obtained, mixed with hydrated sulphuric acid, from which it may be separated by a fresh distillation.

When a large quantity of anhydrous sulphuric acid is conveyed into a small quantity of chloride of sulphur, a blue compound is obtained. As it is very probable that chloride of sulphur is a solution of sulphur in a chloride of sulphur $\overline{S\,Cl^2}$, not yet isolated, the blue colour may be derived from the combination of this dissolved sulphur, it being well known that sulphur gives a blue solution with an excess of anhydrous sulphuric acid.

PURPURIC ACID.

M. Fritzche in January last, read before the Academy of Sciences of St. Petersburgh a notice respecting purpuric acid and its salts.

It is not long since that the name of purpuric acid was given to a substance discovered by Prout, which had neither a purple colour, nor possessed acid properties, but it was so named, because it was extracted, by means of an acid, from purpurate of ammonia. The researches of Liebig and Wöhler on the products of the decomposition of uric acid by nitric acid, have proved that this substance is the product of the complete decomposition which purpurate of ammonia undergoes by most acids, and they have consequently given it the very proper name of *murexane*; but this is not the case with the new name of *murexide*, which these chemists have applied to purpurate of ammonia on account of its not being a salt but an *amide*. This principle could be correct if only one ammoniacal body could be thus formed; but in the year 1848, Prout had shown that a great number of other purpurates could be obtained with the purpurate of ammonia; and soon afterwards Vauquelin described the properties of purpurate of silver: more lately Kodweis analysed the purpurate of barytes; and from this period the purpurates are described in all treatises on chemistry, although the composition of purpuric acid is unknown, and it was known only that it transformed ammoniacal salts into another class of substances. The memoir of M. Fritzche has for its object the reestablishment of the name of purpuric acid, to prove that it really exists as an acid in the salts which have been called purpurates, which is known only in combination with bases, to analyse the purpurates, and to supply the deficiencies which still exist as to our knowledge of the compounds which this acid may form. The following are the results obtained by M. Fritzche.

Purpuric acid has not yet been isolated; when attempts are made to separate it from its combinations by means of acids, it is decomposed, and yields, in dilute solutions, principally *murexane*, whereas with concentrated solutions it forms other products. Purpuric acid forms with bases, salts which are slightly soluble, and remarkable for the fine purple colour of their solutions. Besides these neutral salts, in which the base is to the acid as 1 to 10, it forms basic salts also, but not acid salts. When perfectly free from water, purpuric acid consists of

Hydrogen........	1·581	= H^8
Carbon..........	38·725	= C^{16}
Oxygen..........	31·665	= O^{10}
Azote	28·029	= N^{10}
	100·	

PURPURATE OF SILVER.

This salt, first obtained by Prout, was dried at 266° Fahr. It was analysed by the usual methods, and gave by

	Experiment.	Calculation.	
Hydrogen	1·31	1·32	or H^{10}
Carbon	25·75	25·89	C^{16}
Oxygen........	23·19	23·30	O^{11}
Azote	19·02	18·75	N^{10}
Oxide of silver..	30·73	30·74	$\dot{Ag}$
	100·	100·	

The basic purpurate of silver is obtained by adding ammonia to nitrate of silver until the precipitate is redissolved, and with this solution purpurate of ammonia is to be precipitated. The author could not effect the analysis of this salt, for having exposed it to a temperature of 392° Fahr. in an oil-bath, the whole mass was decomposed.

PURPURATE OF POTASH.

This salt was obtained by Prout, who recommends it to be prepared by decomposing a boiling solution of purpurate of ammonia by means of a solution of bicarbonate of potash; but as it is in this method impossible to avoid a disengagement of ammonia, which when heated acts upon the purpurate, it is better to employ nitrate of potash. The purpurate of potash is difficultly soluble in water, but not insoluble; it is much less soluble in saline solutions: on this account it is proper to employ great excess of nitre in preparing it. This purpurate is pulverulent, and consists of very small reddish brown microscopic crystals; it may also be obtained in large crystals, which have the colour and lustre of the ammoniacal compound, or perhaps rather deeper. The analysis of this salt, carefully performed, gave

	By Experiment.	Calculation.	
Hydrogen......	1·33	1·33	or H^{8}
Carbon........	31·23	32·63	C^{16}
Azote	24·05	23·62	N^{10}
Potash	15·48	15·73	$\dot{K}$
		26·69	O^{10}
		100·	

The indigo blue liquid which is obtained when purpurate of ammonia is dissolved in a solution of caustic potash, is probably derived from the formation of a basic salt, which cannot be procured in a solid form.

PURPURATE OF AMMONIA.

The properties of this salt are perfectly well known by the experiments of MM. Liebig and Wöhler, but still neither the composition nor the formula which they have given is correct. In order to procure this salt, which is prepared with difficulty by the usual methods, M. Fritzche employed a process which yields it readily and in great abundance. This process is derived from the observation he had made, that a large quantity of purpurate of ammonia may be formed by the action of ammonia on pure alloxane; when a concentrated and boiling solution of alloxane is gradually added to a solution of carbonate of ammonia, carbonic acid is disengaged with strong effervescence; the solution on each addition assumes a deeper purple tint, and at last it becomes turbid and precipitates a great quantity of reddish powder, which consists of pure anhydrous purpurate of ammonia. Instead of using pure alloxane, concentrated but not fuming nitrate of uric acid may be employed, taking care to adopt the precautions given by Liebig and Wöhler for the preparation of alloxane. Purpurate of ammonia is not the only product of the operation, but as the composition of the others produced is not known, it would be difficult to give a plausible explanation of the formation of this salt. The analysis of purpurate of ammonia dried at 212° Fahr. yielded M. Fritzche results which differed from those obtained by MM. Liebig and Wöhler. These successive experiments gave

Hydrogen ..	2·82	2·84	2·83
Carbonic acid	34·78	34·43	35·52
Azote	30·70	30·89	

The mean of these analyses agrees very well with the following view:

	Experiment.	Calculation.	
Hydrogen ..	2·83	2·86	or H^{16}
Carbon	34·91	35·10	C^{16}
Oxygen	31·47	31·56	O^{11}
Azote	30·79	30·48	N^{12}
	100·	100·	

The crystals of purpurate of ammonia contain water of crystallization, amounting according to Liebig and Wöhler to 3 or 4 per cent., whereas M. Fritzche found as the mean of eight experiments on very pure crystals 6·06 per cent.

PURPURATE OF BARYTES.

This salt is obtained by mixing a solution of barytes with a moderately concentrated solution of purpurate of ammonia; the liquor becomes turbid, and a blackish green powder is deposited, which by friction becomes of a deep purplish red. M. Kodweis has given an analysis of this salt to fix the atomic weight of murexane, but the result shows, that he had not sufficiently dried it: taking care to do this, M. Fritzche obtained by

	Experiment.	Calculation.		
Hydrogen ..	1·717	1·725	or	H^{12}
Carbon	27·980	28·180		C^{16}
Barytes	21·960	22·045		$\dot{Ba}$
Oxygen		27·650		O^{12}
Azote......		29·100		N^{10}
		100		

So that this salt dried at 212° would contain 22·045 of barytes, 72·772 of purpuric acid, and 5·83 of water; and dried at common temperatures, barytes 19·98, purpuric acid 65·94, and water 14·08.*

ACTION OF FERROCYANIDE OF POTASSIUM ON CHLORIDE OF CALCIUM, ETC.†

M. Reiset added a solution of ferrocyanide of potassium to one of chloride of calcium: the well-known white, crystalline and slightly soluble precipitate was obtained, which he found to consist of one equivalent of ferrocyanide of potassium and one equivalent of ferrocyanide of calcium. He further observed that compounds of analogous constitution are formed when the salts barium, strontium, or magnesium are substituted for those of calcium.

The crystals obtained when a solution of chloride of barium is poured into a hot solution of ferrocyanide of potassium, and which are described in many chemical treatises as being pure ferrocyanide of barium, are composed of 1 equivalent of ferrocyanide of potassium and 1 equivalent of chloride of barium. The ferrocyanide of ammonia also possesses the property of combining atom to atom with the earthy ferrocyanides.

NOTICE FROM DR. HARE, PROFESSOR OF CHEMISTRY, RESPECTING THE FUSION OF PLATINA, A NEW ÆTHER, AND A SERIES OF GASEOUS COMPOUNDS FORMED WITH THE ELEMENTS OF WATER. ‡

TO PROF. SILLIMAN.

Philadelphia, Dec. 15*th*, 1838.

MY DEAR FRIEND,—I send you for the Journal a brief notice of some results, observations, and inferences, which are nearly in the same language in which they were communicated to the Chemical Section of the British Association for the Advancement of Science.

I have by improvements in my process for fusing plàtina, succeeded in reducing twenty-five ounces§ of that metal to a state so liquid, that the containing cavity not being sufficiently capacious, about two ounces overflowed it, leaving a mass of twenty-three ounces. I repeat, that I see no difficulty in extending the power of my apparatus to the fusion of much larger masses.

When nitric acid or sulphuric acid with a nitrate is employed to generate æther, there must be an excess of two atoms of oxygen for each atom of the hyponitrous acid which enters into combination. This excess involves not only the consumption of a large proportion of alcohol, but also gives rise to several acids and to some volatile and acrid liquids.

It occurred to me that for the production of pure hyponitrous æther a hyponitrite should be used. The result has fully realized my expectations.

By subjecting hyponitrite potassa or soda to alcohol and diluted sulphuric acid, I have obtained a species of æther which differs from that usually known as nitrous or nitric æther in being sweeter to the taste, more bland to the smell, and more volatile. It boils below 65° of F., and produces by its spontaneous evaporation a temperature of 0—15° F. On contact with the finger or tongue it hisses as water does with red-hot iron. After being made to boil, if allowed to stand for some time at a temperature below its boiling point, ebullition may be renewed in it apparently at a temperature lower than that at which it had ceased. Possibly this apparent ebullition arises from the partial resolution of the liquid into an aëriform æthereal fluid, which escapes, both during the distillation of the liquid æther and after it has ceased, at a temperature below freezing. This aëriform product has been found partially condensable, by pressure, into a yellow liquid, the vapour of which, when allowed to enter the mouth or nose, produced an impression like that of the liquid æther. I conjecture that it consists of nitric oxide, so united to a portion of the æther as to prevent the wonted reaction of this gas with atmospheric oxygen. Hence it does not produce red fumes on being mingled with air.

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* *L'Institut.* No. 304.

† *L'Institut*, August, 1839.

‡ *American Journal of Science and Arts*, vol. 35, No. 2.

§ Troy weight. The actual quantity fused was 12,250 grs.; the lump remaining weighed 10,937 grs.

Towards the end of the ordinary process for the evolution of the sweet spirits of nitre, a volatile acrid liquid is created which affects the eyes and nose like mustard, or horse-radish.

When the new æther as it first condenses is distilled from quick-lime, this earth becomes imbued with an essential oil which it yields to hydric æther. This oil may be afterwards isolated by the spontaneous evaporation of its solvent. It has a mixed odour, partly agreeable, partly unpleasant. From the affinity of its odour, and that of common nitrous æther, I infer that it is one of the impurities which exist in that compound.

The new æther is obtained in the highest degree of purity, though in less quantity, by introducing the materials into a strong well-ground stoppered bottle, refrigerated by snow and salt. After some time the æther will form a supernatant stratum, which may be separated by decomposition. Any acid, having a stronger affinity for the alkaline base than the hyponitrous acid, will answer to generate this æther. Acetic acid not only extricates but appears to combine with it, forming apparently a hyponitro-acetic æther.

I observed some years ago that when olefiant gas is inflamed with an inadequate supply of oxygen, carbon is deposited, while the resulting gas occupies double the space of the mixture before explosion. Of this I conceive I have discovered the explanation. By a great number of experiments, performed with the aid of my barometer-gauge eudiometer, I have ascertained that if during the explosion of the gaseous elements of water any gaseous or volatile inflammable matter be present, instead of condensing there will be a permanent gas formed by the union of the nascent water with the inflammable matter. Thus two volumes of oxygen, with four of hydrogen, and one of olefiant gas, gave six volumes of permanent gas, which burns and smells like light carburetted hydrogen. The same quantity of the pure hydrogen and oxygen with half a volume of hydric æther gives on the average the same residue. One volume of the new hyponitrous æther under like circumstances produced five volumes of gas.

An analogous product is obtained when the same aqueous elements are inflamed in the presence of an essential oil. With oil of turpentine a gas was obtained weighing per hundred cubic inches $16\frac{5}{10}$ grs., which is nearly the gravity of light carburetted hydrogen. The gas obtained from olefiant gas, or from æther, weighed on the average, per the same bulk $13\frac{5}{10}$ grs. The olefiant gas which I used weighed per hundred cubic inches only $30\frac{5}{10}$ grs. Of course if *per se* expanded into six volumes, it could have weighed only one-sixth of that weight, or little over five grains per hundred cubic inches. There can therefore be no doubt that the gas obtained by the means in question, is chiefly constituted of water, or of its elements in the same proportion H^2 O.

With a volume of the new æther, six volumes of the mixture of hydrogen and oxygen give on the average about five residual volumes. The gas created in either of the modes above mentioned does not contain carbonic acid, and when generated from olefiant gas appears by analysis to yield the same quantity of carbon and hydrogen as that gas affords before expansion.

These facts point out a source of error in experiments, for analyzing gaseous mixtures by ignition with oxygen or hydrogen, in which the consequent condensation is appealed to as a basis for an estimate. It appears that the resulting water may form new products with certain volatilizable substances which may be present.

From the account of the proceedings of the Section, published in the Athenæum, it appears, that after my letter, in which the facts above-mentioned were stated, was read, a Mr. Maugham, who is employed to exhibit the hydro-oxygen microscope at the Adelaide Gallery, London, asserted that I had accomplished the fusion, of which mention has been above made, by means of a blowpipe of his contrivance, which I had purchased while in London.

The opinion which I am obliged to entertain of an individual capable of this groundless assertion, would cause me to consider him unworthy of notice, had not his mis-statement been made before an assemblage which I most highly esteem, and had he not been honoured by a premium for his pretended invention by a respectable British Society.

The blowpipe which is thus falsely alleged to have been used by me, differs immaterially from one of which I published an engraving and description in the American Journal of Science for 1820, vol. ii. p. 298, being a modification of that originally contrived by me and republished in Tilloch's Philosophical Magazine, vol. xiv. for 1802.

Between the instruments described in these publications, or in the Franklin Journal, and that employed by Maugham, the only difference worthy of notice is, that the latter is near the apex bent so as to form an acute angle, and is thus rendered suitable for directing the flame upon a revolving cylinder of lime.

Although I purchased of Newman a blowpipe bent as described, with an apparatus attached for holding and turning a cylinder of lime, *I have never made any use of it*, having for the purpose of subjecting lime to the flame, found my modification above referred to as described in this Journal, preferable. It only required the jet-pipe to be directed upwards in an angle of about forty-five degrees with the axis of the lime cylinder.

I do not consider the form of my blowpipe employed by Mr. M. as qualified for the fusion of any metal.

It is remarkable that an apparatus of gasometers employed by Maugham at the Adelaide Gallery for the supply of the gases for the blowpipe differs but little from the apparatus proposed for the same purpose in my communication above adverted to, and published nearly twenty years ago.

However the process by which I have lately extended the power of the hydro-oxygen blowpipe may differ from those to which I had previously resorted, it differs still more from that modification which Maugham has claimed as his own.

MEMOIR OF M. KUHLMANN RELATIVE TO THE PROPERTIES OF PARTICLES OF PLATINA, AND TO THE PHENOMENA OF ETHERIFICATION.

REPORTED BY M. PELOUZE.

Since the discovery made by Doebereiner of the singular properties of particles of platina, the facts with which it enriched the science remained confined to four: the transformation of alcohol into vinegar; that of pyroligneous into formic acid; the production of ammonia by the contact of deutoxide of azote with hydrogen; and, lastly, the combination of sulphurous acid with oxygen to form sulphuric acid. M. Kuhlmann has taken up the question at this point, and has arrived at new results very interesting. All the compounds of azote are transformed into ammonia by the contact of hydrogen free or carburetted; only, in this last case, hydrocyanic acid is also produced. With the exception of azote, all the gaseous or vaporizable metalloids combine with oxygen under the influence of platina. All the compounds of azote, we have said, are transformed into ammoniac by hydrogen; moreover, they are transformed into nitric acid by oxygen. Accordingly we may make at will nitric acid with ammonia, and ammonia with nitric acid.

The second part of the memoir of M. Kuhlmann is quite distinct from the first, and treats of etherification. It is known that several substances having an affinity to water will transform alcohol into ether; such are sulphuric, arsenic or phosphoric acid, the fluorides of boron and of silicium. Lastly, M. Masson has recently observed the same property in chloride of zinc. M. Kuhlmann has made experiments on the anhydrous bi-chloride of tin. This body combines in several proportions with alcohol, and forms brilliant, colourless, compounds, which easily crystallize. Water decomposes them rapidly. The chloride of tin combines with pure alcohol, with great disengagement of heat. This combination, obtained with an excess of pure alcohol, gives, at about 140°, a considerable quantity of sulphuric ether. If, on the contrary, the chloride of tin is in excess, we obtain only hydrochloric ether, olefiant gas, and sweet oil of wine. Similar results take place with the anhydrous chlorides of antimony and iron; this last in particular gives rise to a remarkably clear reaction. The ether is produced at about 130°, without bringing with it either water or sweet oil of wine. It is the easiest and surest mode of immediately obtaining ether of perfect purity. Pyroligneous acid substituted for alcohol, produces an analogous effect. These two substances also combine with the alkalies, producing a negative effect; but it is impossible to obtain ether from these combinations. On the contrary we may always obtain it from those combinations in which alcohol and pyroligneous acid act positively, and are found in a small excess. But it is remarkable that it is always at about 140° that the ether is produced; it seems that this is the temperature in which the elements of alcohol begin to become independent so as to be able to form new combinations. M. Pelouze desired the insertion of this memoir in the collection of scientific foreigners; which demand was complied with.

EARTHQUAKES IN CHILI.

M. Dumoulin, engineer and hydrographer, on board the corvette *Astrolabe*, commanded by M. Dumont Durville, has transmitted from Valparaiso to M. Arago, various details which he collected, by direction of the Academy, on the earthquakes which have occurred frequently in Chili for some years past.

From the general tenor of these documents it appears, contrary to the opinion generally entertained, that the earthquakes are not more frequent in one season than in another. This results from an observation of 150 shocks remarked during the year 1833 alone, at Conception, by M. Vermoulin, a French physician, and of 1200 of those phenomena, of which the same observer carefully noted the hour and date from the 20th of February 1835.

No one doubts, at Chili, that the earthquakes have the property of lifting up the ground. The people even have a particular expression to designate that effect: they say that *the earth remains suspended* (*suspendida*). They add, that the suspension is never the effect of *horizontal shocks: it is only the undulatory shocks* that can produce it.

On the subject of the elevation of the ground consequent on the earthquake of the 20th of February 1835, on the coast of Chili, we will now give some extracts from the letter of M. Dumoulin, which may be placed with those which Captain Fitzroy collected at the time.

Opposite Fort St. Catherine, at Talcahuano, there is a shelf of rocks extending to the land, and terminated, towards the open sea, by a head which used to be covered by the lowest tides; from the 20th of February it has remained constantly uncovered; scarcely do even the highest tides bring the level of the water to its summit.

The little river Fabul, 22 or 23 leagues from Talcahuano, which was in 1835 still navigable for small vessels as far as 300 metres above its mouth, became fordable after the earthquake of the 20th of February 1835; it was remarked every where that the beds of the rivulets and small rivers had been raised.

" Coste, captain of a whaler, now commanding the *Ocean*, has for a number of years frequented the seas off the coast of Chili. In looking through his journals, we have succeeded in collecting some data which will leave no doubt respecting the lifting up of the ground consequent on the earthquakes.

On the 15th of February 1834, he chose his anchorage under shelter of the Island of St. Mary, and let fall his anchor in 29 feet of water. He did not leave that anchorage until the 15th of May. In the following year, 1835, on the 3d of May, he came to resume his anchorage near the island of St. Mary. On careful examination, he could not find more than 20 feet of water for anchorage, and at length he dropped his anchor in the place which he had occupied the preceding year. On going ashore he perceived a general disorder. The coast had changed its aspect in consequence of the tumbling of the ground. What struck him above all was, that some rocks which used never to be uncovered at low water, and on which he used to send his men to fish, with the water up to their middle, were now exposed to view and not covered even at high water. He questioned the inhabitants of the country on these changes, and learned that they were the consequence of the earthquake which desolated those regions on the 20th of February 1835. The whole night his ship laboured much by the rushing of the sea, occasioned by continual small shocks. The next day he set sail, fearing to retain so dangerous an anchorage.

On the day of the earthquake (20th of February 1835), Captain Coste had anchored his vessel near the island of Lemus. He experienced there the weakened effects of the earthquake. At noon, a violent rush of the tide was sufficiently strong to break the chains of the ships *Narwal* and *Gange*, which were with him at anchor.

On the 17th of November 1837, being in 43° 18′ South Lat., in sight of land, his masts were shaken, and his ship agitated by the earthquake which destroyed Valdivia.

On the 11th of December 1837, he came to resume his anchorage near the island of Lemus. The shock of the 7th of December had raised the bottom more than 8 feet. Some rocks, which formerly had been always covered by the sea, now remained constantly exposed. An enormous quantity of shells, and fish in a state of decomposition, thrown on the shore either by a sudden elevation or by the oscillations of the sea, shewed that the event had been of recent occurrence. A great quantity of trees, torn up by the roots and carried to sea in those shocks, were to be seen along the shore.

SEPARATION OF LIME FROM MAGNESIA.*

BY M. DOEBEREINER.

When chloride of magnesium very anhydrous is heated, that compound absorbs oxygen, and yields its chlorine. This decomposition, that is, the transformation of the chloride of magnesium into magnesia, is effected more rapidly when the chlorate of potash is used instead of air. This reaction permits the separation of the lime from the magnesia, and in the easiest manner. The mixture, or compound of dolomite, for example, which contains these two earths, is dissolved in hydrochloric acid; the solution is evaporated to dryness, the remainder is heated in a capsule in platinum so long as hydrochloric acid is disengaged, and when the mass is heated so as to be growing red, chlorate of potash is added to it in small portions, until there is no longer a developement of the least trace of gaseous chlorine. The mass which remains after the evaporation consists in a mixture of chloride of potassium and of chloride of magnesium, which it is easy to separate by exposing them to the action of water, filtering the solution, precipitating the liquid by the carbonate of soda, &c. The author has convinced himself, by a great number of experiments, that the chloride of many metallic minerals may be decomposed in the same manner, and thus transformed into oxide, while the chloride of many other metals experiences no decomposition.

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* From *Jour. für pract. Chemie*, xvi.

MEMOIR ON THE NUTRITION OF PLANTS.

BY M. PAYEN.

The author has proposed to himself in this essay to develop the chemical theory of the nutrition of plants. He shews that in the cambium, or liquid preceding the vegetable formations, a granulous, contractile substance, appears in the first instance. Its composition is azotic ; it must assimilate to itself a nourishment of similar composition. This substance, being gradually developed, is soon enclosed in cells, the membranes of which are composed solely of carbon, hydrogen, and oxygen, in the proportions requisite to form water. These three elements must therefore be among the agents of vegetable nutrition. The author afterwards remarked the formation of a substance of which the composition, rich in carbon, gives a proportion of hydrogen three times more considerable than that which would, with its oxygen, constitute water. He deduces from this new fact the explanation of the necessity of an excess of hydrogen in vegetation, and of the water which yields it. The production of this hydrogenous matter, of a thick consistence, employs the greatest part of the hydrogen, which is in excess in cryptogamous and herbaceous plants. To this are joined, for these ligneous plants, considerable portions of hard incrusting matter.

THE INFLUENCE OF COLD ON CAPILLARY CIRCULATION.

BY M. POISSEVILLE.

In my memoir upon the causes of the motion of the blood through the capillary vessels, I have examined particularly the action of heat and cold upon capillary circulation. I observed, the temperature being 20° C, that by putting particles of ice in a receptacle, as, for instance, a bullet-head, the circulation in the capillary tubes became slower and slower, the globules separated, becoming deranged in form as they sought to make way across these vessels, and they resumed their primitive form when passing through vessels of a larger calibre. By a longer stay in water at a temperature of 1° to 2°, the circulation ceases in the greater number of capillary tubes, and if we then measure the calibre of these vessels, we find their diameters varying from 0·018 to 0·020 of a millimetre from before the ice was applied; but if we maintain this low temperature by means of a new supply of ice, at the end of a certain time the globules of the capillary vessels in which the circulation had entirely ceased, would undergo a slight disturbance through the influence of the contractions of the heart. These oscillations of the globules acquiring a greater and greater amplitude, very soon change into a progressive motion, which becomes more and more rapid ; so that, at the end of about three quarters of an hour, the circulation is as quick in this ambient medium, which is some degrees above zero, as in the open atmosphere. Certain vessels, which, previous to the action of the ice, gave way to two or three globules in front, offer no more than one single rank of globules which move on their axis. The latter vessels, as also those of a greater calibre, appeared not to have changed their volume ; but the capillary vessels, which then produce a circulation as quick as in the normal state, have a greater diameter. The diameter of from 0·018 to 0·020 of a millimetre, when all the circulatory motion was destroyed, became 0·022, 0·024, 0·026, 0·030, and 0·034 of a millimetre ; that is to say, the capillary vessels had doubled and trebled their volume. Some few other capillaries, which were quiescent, had not, as in the case of the preceding ones, augmented their calibre. If we remove the ice, the circulation is soon re-established in these latter vessels, and at the end of a few hours, all the capillaries resume their primitive volume.

Thus, under the influence of the contractions of the heart, the *living* tubes would acquire, by a prolonged action of cold, a more considerable volume.

Having preserved during the winter some bull-heads which were collected in July, I found that in January their capillary vessels were augmented in volume. The place occupied by these insects was at a temperature of two degrees above zero.

The same experiments made upon the bladder of very young mullets presented much greater difficulties. In fact, from the moment that the ice comes in contact with the capillaries of these mammiferous animals, and continues but for a few minutes, the circulation decreases, and finally is entirely destroyed. But if we replace the ice by some water at 10 or 12 degrees (the circumambient temperature being at 25° C) the circulation becomes gradually re-established, but only in those capillary vessels, which have, as in the preceding case, augmented their volume.

From the preceding facts, I cannot but conclude that the points of the tegumentary surface of the human body which are usually exposed, as that of the face, the neck, the hands, &c., and consequently submitted to a mean temperature less than that of the body itself, have their capillary vessels of a larger volume than those of other portions of the skin.

ON THE EXISTENCE OF ARSENIC IN THE BONES OF MAN.

BY M. ORFILA.

He read an account of experiments on the arsenic contained in the body of man. The experiments were made in conjunction with M. Couerbe; they had for their object the solution of the following questions:—

1. Does arsenic exist in the normal state in the human body?—2. Do the viscera contain any?—3. Can we demonstrate the existence of it in the muscles?—Lastly, is it possible to establish that the arsenic obtained from a dead body is not that which existed in a normal state among the elements which compose the tissues, but has been introduced into the digestive organs, applied to the exterior, &c.

I. Arsenic exists in the bones of man: by calcining the bones of adults, taking care not to raise the temperature too much; by exposing to purified sulphuric acid the powder thus obtained, well dried and sifted; then by submitting the mixture to Marsh's apparatus; we shall obtain arsenical spots, brown, brilliant, and very thick.

This result has been obtained equally from bones taken out of the bodies of adults dead for several days, and from those inhumed several months.

Calcination to a white powder does not give arsenic. Neither is it obtained by operating on the bones of commerce reduced to a soft paste; but if they are submitted to heat at first, and to the processes which I have pointed out, (nitric acid, potash, sulphuric acid,) a certain quantity of arsenic is obtained.

From this first series of experiments, which are to the number of 14, I conclude, says M. Orfila,—1. That the bones of the adult man, of the horse, of the ox, of the sheep, contain small proportions of arsenic, which it is possible to establish by submitting the bones to alcoholized potash and sulphuric acid pure.

2. This quantity of arsenic does not increase by a prolonged inhumation.

3. Vitrification removes it in part; doubtless, by the volatilization which it causes.

4. As favourable conditions for the detection of arsenic, it is necessary to lay stress, first, on taking care not to calcine the bones too much; and, in the second place, on carefully avoiding the contact of the coal.

5. In submitting the bones to pure water, and to boiling, no arsenic is found.

6. If, in operating in this manner, arsenic is found, it may be affirmed that it has been introduced in one way or other into the economy.

II. Arsenic is not found in the viscera unless it has been absorbed by them. The organs of a dog, which had just been hanged, treated by the ordinary processes, gave none. The blood, the cerebral substance dried, the liver, the spleen, the kidneys, the intestines, the stomach, &c., offered no traces of it.

Carbonized with nitric acid, and subjected afterwards to Marsh's apparatus, they exhibited only white opaque spots, which were all produced as well without the presence of those organic substances.

The liver of an adult did not exhibit any thing more. Neither did decoctions made with various other organs.

Whence we must conclude, says M. Orfila, but not in an absolute manner, that the viscera do not contain arsenic in a normal state; but, in order to be more exact and to avoid prejudging, that they do not furnish any when treated by boiling water or hydrosulphuric acid, or carbonized by the aid of concentrated nitric acid, &c., it may have existed in so small a quantity, that the hydrosulphuric acid failed to detect it, or the carbonization may have caused it to be lost. Perhaps, by acting at once on a great number of brains, or other organs, we might find it. In all cases, it is sufficient for the moment to establish that the viscera do not yield arsenic by the tests indicated unless there has been a poisoning.

III. It is not proved that muscular flesh contains arsenic. Twelve pounds of muscular flesh taken from the body of an adult, treated by carbonized nitric acid, and then placed in Marsh's apparatus, exhibited white opaque spots, some shining, with a blue or rust-coloured reflection, others yellow, becoming dull on exposure to the air, having an arsenical appearance, dissolving in boiling nitric acid, not giving the smell of garlic when the residue was put on live coals, offering, in a word, none of the characteristics of arsenic. Moreover, these spots, which were very numerous, being exposed for nearly 20 days to a current of hydrosulphuric arsenic, gave no indication of arsenic. It is possible that they were a mixture of arsenic and animal matter; or, secondly, that the muscular flesh of two or three bodies united might yield some on analysis; lastly, that other processes might procure it from the same quantities by occasioning less loss. Accordingly I would not conclude in an absolute manner that arsenic ought not to exist in muscular flesh.

IV. It is possible to establish that the arsenic which has been found does not come from the organized substance itself, but that it has been combined with it by absorption. For, if it is in the bones we find it, they must have been acted on for a long time, the action of boiling water will have had no effect, &c. If, on the contrary, the action of this last menstruum produced it, it might be affirmed that it did not already exist in totality. If it is found in organs in which up to the present time it has not been detected, in the blood, in the viscera before enumerated, the same conclusions will be established.

Lastly, if the muscles exhibit spots some of which so much resemble arsenic at first sight, the distinctive characteristics which we have enumerated must be remembered. Attention must be paid to their number, which is considerable, and, above all, to the results furnished by the action of different tests. If, lastly, the subject had undergone arsenical medical treatment for some time, our observation should be directed at once to the morbid phenomena which may have existed long before death, and to those which have immediately preceded, and seemed to produce it. We should carefully consult the anatomical state of the digestive organs; we should compare the symptoms with the lesions observed after death; and we must form our conclusion in all cases with extreme circumspection, particularly if we find in the digestive organs only a small quantity of poisonous substance, as in this case the poisoning might be confounded with the effect of the arsenical treatment.

I here terminate the account of the experiments, which I wished to communicate to the Academy, says M. Orfila. They have been undertaken more especially on the occasion of a criminal trial which is soon to come on in the Côte d'Or. I hope they may throw light on the arguments about to be opened. It is to that end that I have made them. I do not yet regard them as decisive and safe from objection; but I call for the objections, for I desire above all to bring truth to light; but I think that facts alone, and not theories, can with any foundation be opposed to the positive experiments, of which I have just communicated the principal results.

II. CHEMICAL MANUFACTURES.

ON THE DISCOVERY OF M. DAGUERRE.*

An important discovery has for some time occupied the attention of scientific men and artists. We speak of the invention of the Daguerréotype, of the photogenic processes, and the theories which have relation to the brilliant discovery of M. Daguerre. Independently of the precious results, of the immense resources which it offers to the arts of design, the daguerréotype touches on the physical and chemical sciences in so many points, that we cannot avoid entertaining our readers with it, although perhaps a little tardily.

Every one knows that the invention of M. Daguerre has for its object to fix the images produced by the Camera Obscura, and thus to create in some minutes, by the action of light, designs in which the objects preserve mathematically their forms even to the smallest details; in which the effects of linear perspective, and the gradual diminution of tone, attendant on aërial perspective, are exhibited with a delicacy hitherto unknown.

It is easy to see what resources, what perfectly novel facilities, this invention must offer for the study of the sciences; as to the arts, the services which it is capable of rendering are beyond calculation.

Without dwelling on the investigations which have had an analogous result for their object, and which at different periods have been, as it were, the prelude of M. Daguerre's discovery, we will rapidly describe the instrument and the processes, by the aid of which that skilful artist has resolved so important a problem.

A plate of copper, silvered over, is taken: this plate ought to be surrounded by a languet of the same metal, fixed by means of small nails. It is to be carefully freed from verdigris with nitric acid spread by water. A capsule filled with iodine, and covered with a metallic gauze, is placed at the bottom of a box. The metallic plate is put inside of this box, above the capsule, which contains the iodine, and the box is closed. At the end of a certain time the plate is found covered with a light layer of vapour of iodine, which gives it a tint of golden yellow. It is then withdrawn from the box and placed in the focus of a dark chamber. In some minutes only, the action is produced, although the image is still invisible on the pellicle of iodine. The plate is then withdrawn from the camera obscura, and put into a box, at the bottom of which is a capsule containing mercury, which is heated by means of a lamp placed under. The metallic plate ought to be placed here in such a position as to make an angle of 45° with the vertical line. If it were placed in an horizontal position, the image would not be seen, in its maximum of effect, by the eye of the spectator, without inclining the plate so as to make an angle of 45° with the visual ray. The mercury is heated to 60°. In looking then through an opening made in the side of the box, the plate is seen, accordingly as it is covered with mercurial vapours, to become overspread with traces, which soon will be the complete representation of the image formed in the focus of the dark chambers. The plate is withdrawn from the box, plunged into the hyposulphite of soda, washed with distilled water, and all is complete.

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* From the *Journal de Pharmacie.*

It will be seen that, by the discovery of M. Daguerre, physics have acquired a reagent remarkably sensible of luminous influence, a new instrument which, according to the expressions of M. Gay Lussac, will be, to the intensity of light and luminous phenomena, that which the microscope is for small objects, and which will certainly furnish the opportunity of new researches and new discoveries. Bass-reliefs, statues, monuments, in a word all dead nature, are represented with a perfection unapproachable by the common processes of design and painting; the perspective of landscape, of every object, is traced with mathematical certainty; no accident, no feature even unperceived by our eye, escapes the eye and pencil of the new painter; in fine, the industrial arts for the representation of forms, design for perfect models of perspective and different intensity of light and shade, the natural sciences for the study of species and their organization, will find immense resources in the application of this admirable discovery.

Science, as may easily be imagined, is eager to study all the circumstances of M. Daguerre's processes, and to seek, in the phenomena which result from them, some facts, or at least some considerations, by which physics and chemistry may profit. However unsatisfactory the explanations hitherto given of these phenomena may be, we will here say a few words on the different attempts which have been made on this subject.

We have seen, in the description of Daguerre's process, that the metallic plate was to be surrounded by a small languet, and that the capsule in which the iodine was exposed to spontaneous evaporation was covered with a metallic gauze. These two precautions have for their object the uniform distribution of the iodine on the surface of the plate; a light coat, of extreme thinness, which forms as it were the cover of the picture. The thickness of this yellow stratum of iodine, which according to M. Dumas, is not raised to more than *a millionth of a millimeter*, ought to be exactly the same throughout. The languet which surrounds the plate prevents more iodine from being deposited at the edge than in the middle; but a satisfactory explanation has not yet been found of the physical mode of action of this languet.

A circumstance no less mysterious is the necessity, in order to obtain the maximum of effect, either of inclining the plate to an angle of 45°, when it is submitted to the ascending current of the mercurial vapour, or of looking under the same inclination, if it has been placed horizontally, at the moment of the sublimation of the mercury.

As to the explanation of the chemical phenomena, the idea which at once presents itself to the mind is that the light, in the camera obscura, determines the vaporization of the iodine wherever it strikes the coat of gilding; that there the metal is denuded; that during the second operation, the mercurial vapour acts freely on these denuded parts, and there produces a white and dull amalgam of silver and mercury; that the washing with hyposulphite has for its end the removal of the portions of iodine which the light has not disengaged, artistically, the stripping of the shining parts which ought to be black. But, in this theory, what would those innumerable semi-tints be, so marvellously toned, which are exhibited in M. Daguerre's designs? A single fact proves also that things are not so simple; the plate of metal does not increase in weight perceptibly by being covered with the yellow layer of iodine. The increase on the contrary, is very perceptible under the action of the mercurial vapour. Well! M. Pelouze has convinced himself that after the washing in hyposulphite, the plate, notwithstanding the presence of a little amalgam on the surface, *weighs less than before commencing the operation.* The hyposulphite therefore carries away silver, and the chemical examination of the liquid shews that it is really so.

More recently, new observers have sought to give an account, by aid of a theory more or less ingenious, of the photometric phenomena produced by the daguerréotype.

Thus M. Donné has observed, that the coat of iodine adheres very tenaciously to the silver at the moment of withdrawing the plate exposed to the iodic vapour and before exposing it to the light; that then it resists the rubbing of the finger; but that after the action of the light, the adhesion of that coat is destroyed; so that the least friction is sufficient to detach it from the metal. M. Donné has thence concluded, that on the enlightened parts of the image, the layer of iodide of silver having no adhesion to the plate, does not preserve the silver from the action of the mercury; accordingly we see plainly, after the operation, that metal condensed into small drops very perceptible under the microscope on the points struck by the light; while, in the shaded parts, the coat of iodide, always adhering, has not permitted the mercurial vapour to fix itself there. To sum up, the image produced by the process of the daguerréotype would be formed: the light parts by the mercury condensed into globules, and probably amalgamated with the silver; and the shadows by the mere burnishing of the silver, by the naked metallic substance, without any deposit of another substance. Indeed, when after the operation, all traces of the remaining iodide have been removed by the washing with the solution of hyposulphite of soda, the dark or shaded parts are naked and reflect the light, like polished or burnished bodies and glass, while the enlightened points are covered with a layer of a greyish white, easily removed, soiling the fingers, and in which the microscope shews a crowd of mercurial globules.

M. Golfier Besseyre thinks that the light acts on the iodide of silver-like heat; that this action has no other effect than to modify the molecular state, and to convert it into an isomerous body. The mercury in vapour which comes to the iodide of silver thus modified by the action of light, is condensed there and remains there in very brilliant globules, while the iodide of silver on which the light has not acted, yields iodine to the mercurial vapour which passes into the state of yellow iodide. The iodide of silver, modified or not by the light, would thus perform a function of reserve, either to receive and retain the mercury, or to turn aside the mercurial vapour by furnishing iodine to it, and the mercury must remain there only to form the light parts of the image.

Finally, M. Auguste Wallet has observed, by the microscope, the metallic plate after its exposure to the vapour of iodine, and thinks that he has seen a great number of little holes, of which the diameter varies from 0·03 to 0·08, observations on which he founds a new theory of photogenic phenomena.

Such are the different hypotheses which up to the present have been invented to account for the beautiful results of the discovery of M. Daguerre. Ulterior researches will doubtless cast a new light on these mysterious phenomena. In the mean time the discovery, happily, exists; and, as M. Arago has said, thousands of beautiful designs will probably be made with the daguerréotype, before its mode of action has been completely analyzed.

PREPARATION OF PRUSSIAN BLUE.*

BY MR. LEWIS THOMPSON.

In the usual mode of manufacturing Prussian blue, the requisite carbon and nitrogen are obtained by decomposing animal matter in contact with potash. In this process the potash, being reduced to the metallic state, causes the formation of cyanogen, in consequence of its affinity for that substance. The quantity of nitrogen furnished by a given weight of animal matter is not large, and, in the material employed by manufacturers, seldom perhaps exceeds eight per cent.; and of this small quantity at least one-half appears to be dissipated during the process, thus producing an enormous waste of material, and at the same time increasing the size of the apparatus. Reflecting on these circumstances, it occurred to me that the atmosphere might be made to supply, in a very economical manner, the requisite nitrogen, if allowed to act on a mixture of carbon and potash under favourable circumstances. The experiment proved on trial to be correct, and in some measure exceeded my expectation; for the carbonaceous matter employed may be worked over again many times, and is even improved by each operation. I found it necessary to use iron, for a reason which will be apparent in the explanation of this process; when iron is not employed, a much higher temperature is required.

To produce Prussian blue, the following method may be adopted, but experience alone can teach us the best proportions; and in this, as in most of the arts, the caprice of each manufacturer will probably lead to the adoption of various proportions of the ingredients used.

Take of	potash or pearlash....	2 parts;
	coke, cinders, or coals .	2 parts;
	iron turnings	1 part.

Grind the whole together into a coarse powder, and place it in an open crucible or other convenient vessel, and expose the whole for half an hour in an open fire to a full red heat, stirring the mass occasionally. During the process, little jets of purple flame will be observed to arise from the surface of the mixture; when these have almost ceased to appear, which will happen about the time specified, the whole must be removed from the fire, and allowed to cool: water is now to be added, so as to dissolve the matter soluble in that fluid, and the black matter remaining put aside for another operation. The solution, after being filtered, is to be mixed with one part of copperas, and muriatic acid added in the usual way to brighten the color of the precipitate. The quantity of Prussian blue produced from a given weight of pearlash or potash is generally about one-fourth of the weight of the pure potash contained in the salt; but the larger the quantity operated upon at one time, the larger is the relative produce. Thus six ounces of pearlash, containing 45 per cent. of alkali, yielded only 295 grains of Prussian blue, whilst one pound of the same pearlash yielded 1355 grains. The Prussian blue here spoken of is the pure perferrocyanate of iron.

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* From the *Transactions of the Society of Arts*, &c.

In this process the potash is decomposed by the iron, producing potassium, which, being volatile, rises and combines with the carbon of the coke and with the nitrogen of the atmosphere, the oxygen of which has been removed by passing through the fire, or by the coke or cinders. In the mixture, the cyanide of potassium thus formed, is next dissolved in water, and furnishes ferrocyanate of iron on the addition of sulphate of iron and muriatic acid, according to the explanation given in most chemical books.

By deflagrating a mixture of nitrate of potash, coke, or small coals, and iron turnings, a mass is obtained which furnishes abundance of Prussian blue; but, in this case, the nitrogen is derived from the decomposition of the nitric acid of the nitrate of potash, for the experiment succeeds equally well in a close vessel. In these experiments, soda may be substituted for potash without affecting the result: the charcoal from most kinds of vegetables, cannot, however, be employed in place of that from coals, as it is very porous, and burns away too quickly. The presence of cyanide of sodium in barilla, kelp, and English alkali, is thus easily accounted for; and the small quantity of cyanide of potassium invariably produced during the process of preparing potassium, admits of a similar explanation.

ARTIFICIAL PREPARATION OF BROWN CASHOO.*

BY M. H. REINSCH.

For some time Cashoo has begun to be made use of in the tincture for the preparation of a very beautiful brown colour, fine and durable, which was formerly obtained by means of madder, and more slowly by the sulpho-arsenide of potash and of lead. The tincture by means of cashoo is prepared thus: it is dissolved in boiling water, with a certain quantity of sulphate of protoxide of manganese; cotton fibres, first operated on by acetate of lead as a mordant, are passed through lime-water, then plunged into a solution of bichromate of potash, and finally passed into the solution of cashoo. The success of stuffs dyed in this manner appears to have speedily exhausted all the cashoo which existed in store, so that the price of good brown cashoo was more than doubled. It is true, that besides this beautiful brown cashoo, another yellow cashoo is known in commerce, usually consisting of bits of the thickness of the thumb, of a cubic form, the price of which (in Germany) is little more than the third part of the present price of the former. Notwithstanding this difference, dyers have continued to reject the yellow kind, because the brown gives, in their opinion, a colour much richer, and, at least, double the colouring matter. But if the brown cashoo were prepared by means of the yellow, the remarkable difference in price could no longer exist. In all cases, it was necessary to seek that which gave a superiority to the brown cashoo over the yellow; and on this subject some indications of science appeared to establish that the brown colour was owing to a particular preparation of yellow cashoo, since the catechouic acid is transformed, by the action of air and heat, into japonic acid. However it may be, the preparation of brown cashoo from the yellow is very simple. The yellow cashoo is melted at a very moderate heat, and for every 100 kil. of matter, 1 kil. is added of bichromate of potash reduced to a fine powder, which probably yields oxygen to the cashoo; the melted cashoo is poured into wooden vessels, in which it forms, after cooling, a brown blackish mass, with a conchoidal fracture, which, in a humid atmosphere, becomes a little clammy, possesses an astringent taste, but which does not retain the sweetish after-taste of the yellow cashoo. When the yellow cashoo is melted alone, a brown mass is obtained undistinguished from that prepared with bichromate of potash; which leads to the inference that the addition of that salt may be useless in preparing a good colouring matter. The brown cashoo of the East is therefore probably distinguished from the yellow only by a particular preparation. The best proof to make cashoo undergo will always be its degree of solubility in alcohol, in which it ought not to have an insoluble residue of more than $\frac{1}{12}$ of its weight. The mixture of bichromate of potash will always be easily recognized by the incineration and the solution of the ashes in nitric acid. As to the pharmaceutic uses, the preference should be given to yellow cashoo, because we are here to consider not the quantity of colouring matter sought, but the action of the tannin.

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* From *Jour. für pract. Chemie,* xvii.

PRESERVATION OF BODIES FOR DISSECTION.*

BY DR. MARSHALL.

Having lately observed in the Medical Gazette an account of some experiments performed by Drs. Babington and Rees, with the view of preserving the human body for the purposes of dissection, a desideratum, which, if attainable, would be of no small moment, not only to the student of anatomy, but also to the practical anatomist; however, the last and best of the experiments described by these gentlemen, appears to be so much loaded with trouble and expence, as to prevent it ever becoming generally useful to either the one or the other.

Permit me, therefore, through your means, to offer to those who desire it, a much more simple, a far less expensive, and equally efficacious remedy for this purpose. When the body is first received into the dissecting-room it must be punctured over the whole surface with acupuncture needles, or the point of a narrow bistoury, scalpel, or scissors, the punctures being made pretty closely together, and deeply over the fleshy part; and, if for a dried arterial or venous preservation, the punctures ought to be made with very fine needles, and after injection; as, if done with bistoury or scissors, the wax, when exposed to heat, exudes from the punctures made in the vessels.

This being done, the body is brushed over with acetic acid — specific gravity 1·048, which must be brushed into it slowly and repeatedly, so that the acid may fully penetrate the innermost parts; a small incision may likewise be made in the thoracic and abdominal paries, through which a sufficiency of the acid, slightly mixed with water, may be poured.

Repeating the application of the acid to the surface of the body, for six or eight days, will not only preserve it free from putrefaction, but, at the same time, remove incipient greenness, and every species of odour, except the pungent, yet volatile odour of the acid, which, I should think, could be easily borne by the most fastidious student.

The only trials as yet made in the above way, have been, 1st, Catharine Diamond, courtesan, aged 26, cause of death not known, brought into the University dissecting-room on the 18th of May, three days after death, where, being Saturday night, the body lay till Monday morning, when it was placed in warm water for the purpose of arterial injection; after the body had become cold it was punctured with a pair of scissors, then brushed with the acid, as already mentioned; and by night the body (and during the day those parts not being dissected) was covered with damp cloths to prevent evaporation and consequent dryness: after three brushings, the abdominal muscles, which had become perfectly green, were restored to a fine natural colour; and the abdominal cavity, into which the diluted acid had been poured, though not opened for twenty-four days, was quite free from odour or the slightest appearance of putrefaction. The body remained on the table from the 18th of May till the 4th of July, fully exposed to the heat of a powerful sun in a room well lighted from the roof; and had it been necessary, by the same means it might have been preserved soft and beautiful throughout the warmest summer.

2d, John M'Caskle, labourer, aged 45, died 4th of November, in the Royal Infirmary, where the body had been inspected, received into the University dissecting-room on the 6th, where the body lay till the 16th, when the whole of the face, trunk, and upper extremities, became altogether green, and fast tending towards decomposition. On the 16th the discoloured parts were closely punctured with a pair of scissors, and three gills of acetic acid slowly brushed thereon; damp cloths were then placed upon the parts till the 18th, when the acid was again applied. On the 19th the remainder (altogether five gills) of the acid was used, and on the 20th the whole of the parts into which the acid had been brushed were perfectly restored to whiteness; and, indeed, the changed colour of the parts could be easily perceived after each application of the acid, more especially when the cloths were moistened with the acid, and closely applied to the parts.

The dissection of the body was commenced on the 20th November; and, on removing the skin of the face, neck, trunk, &c., small portions of the muscles of the trunk and upper extremities were a little green, but they were firm, and wholly free from odour, which last circumstance formed a broad contrast to the smell of the cranial cavity, where none of the acid had been used; the muscles of the face and neck having undergone less change, were entirely free from colour.

The punctures made in the skin, when large, give the body a somewhat odd appearance, but beyond this they are harmless, as the subjacent parts are thereby not at all injured for common anatomical pursuits; yet, if the cloths are wetted with equal parts of acid and water, and closely applied to the body, the finest long needles may be used; by this means the punctures are hardly perceptible, and two days' application in this way will beautify any subject.

The second subject was undergoing dissolution so rapidly that no student thought it worthy of dissection; however, on beholding the magical influence of the acid in restoring the natural colour and removing incipient putridity, the parts so improved were eagerly sought after.

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* From the *Medical Gazette.*

For the above method of using the acid I am indebted to a pupil of my own, Mr. Daniel Wilson, of the Royal Navy, who, having formerly witnessed my many fruitless and expensive attempts to preserve the body, even for a short period of time, by injecting it with pyroligneous acid; and, moreover, having seen the antiseptic virtues of this acid fully and beneficially tested within the tropics, by preserving recently-killed animal food for an indefinite length of time, was induced to give it a trial, in the manner now described, and the trouble, as already mentioned, was very trifling; and the expense did not exceed, in the first instance, five shillings, in the second, little more than two, although buying the acid at the retail price.

By allowing the above to occupy a spare corner in your valuable journal, you will greatly oblige, sir,

Your obedient servant.

III. PHARMACY, &c.

CONSUMPTION AND TRADE OF OPIUM IN CHINA.

The sale of opium in the Chinese empire is forbidden by very severe laws; but the taste of the people prevails, and the avarice of the tradesman makes him brave the fines, the corporal punishments, and the conflagration of his shop and house, for the law condemns to the flames every house guilty of having this substance concealed. The demand for opium is about the same every year, and is regularly answered by the supply, in spite of the vigilance of the government agents. The Chinese take opium in different ways; they appear to give the preference to a mode of enjoying it, which is little or not at all known in Europe; they mix it with their tobacco, and the smoke of this mixture plunges them into a dangerous intoxication. The opium of Bengal is most in demand for smoking, on account of its perfume; but those who seek stronger impressions, followed by a more complete intoxication, chew the opium instead of smoking it, and they call for the opium of Malwa, which is most rich in morphine. It is for the same reason that this kind is generally preferred in the islands of Asia. It has even obtained such a preference in the market of Canton, that the opiums of Patna, Benares, Bengal, and Turkey, were threatened with a considerable fall, or even an entire exclusion.

The Chronicle of Singapore furnishes some curious details respecting the trade and consumption of opium in China. We take the year 1825, as offering a mean.

In 1825,

3442 chests of the Patna and Benares, at the rate of 975 dollars, or 5362fr. 50c.	18,457,725fr.
6276 chests of the Malwa, at the rate of 705 dollars, or 3877fr. 50c.	24,218,865fr.
General Total	42,675,590fr.

The Malwa, independently of the inferiority of its price, contains 14 per cent. of pure opium; while that of Patna and Benares contains only 9 per cent. This makes it more sought for. J. de F.

OPIUM SMOKING.—THE MEXICAN PLANTS.*

Dr. Sigmond gave a lecture on opium eating and its effects. After enumerating the various evils, both bodily and mental, which invariably overtake the habitual opium eater, he referred to the practice of smoking opium as carried on to a fearful extent by the Chinese. The way in which they conduct the process is as follows:—Having "purified" the opium by maceration in water, and dried it, they place it in the bulb of a pipe with a long tube. They lie on their backs on a couch, with the head elevated, and take in one whiff of the opium smoke, which, after retaining for a very short time in the lungs, they expire gently, and in such a manner that it comes out of the eyes and nostrils. The effect is immediate and very great. All the intoxicating influence of opium seems augmented, and some even fall victims to its excess. The injurious influence upon the constitution of the patient is in proportion to its intoxicating power; premature old age, nervous debility, mental and bodily imbecility, are the unfailing lot of the opium smoker. So fascinating is the influence of this noxious drug, that many would prefer death to exclusion from smoking it. The inhabitants of colder regions do not seem to be influenced by smoking opium to any thing like the extent that is observable in eastern countries.

Dr. Sigmond then alluded to the introduction of medicines into the system, by inhalation, and stated his determination of delivering some lectures before the Society on that subject.

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* Royal Medico-Botanical Society. Wednesday, Nov. 13, 1839.

Dr. Farre made some observations on a variety of plants which had been transmitted from Mexico; the only remarkable circumstance connected with which, was the great number of compositæ found in the Mexican flora.

After a few words from the chairman the Society adjourned.

NARCOTINE, A SUBSTITUTE FOR QUININE.*

Numerous experiments have of late been made in India with the view of ascertaining what substances of native growth could be substituted for the more expensive imported medicines. Of these, narcotine, as a substitute for quinine, has been submitted to extensive trials, and given the most satisfactory results. The narcotine was employed in the form of muriate, and administered in three-grain doses, and a number of cases are related where, from two to four doses of the narcotine succeeded in curing agues, which had resisted quinine, arsenic, *Cæsalpinia Bonducella*, and other native remedies.

Dr. Stewart of Calcutta, after enumerating a list of cures effected by this substance, thinks he is warranted in arriving at the following conclusions:

The muriate of narcotine is a perfectly safe agent to any extent, and in large or small doses, that, as a substitute for quinine, it is unexceptionable, and possesses over the latter many attributes which render it both a safer and more generally useful remedy in all the fevers of Bengal.

These are, 1. In small doses it proves antiperiodic, if given in the intermission some hours before the expected paroxysm.

2. In ten-grain doses it is powerfully and immediately calmant, sudorific, and antiperiodic.

3. It does not in such doses accelerate the pulse, nor exalt the sensibility of the nervous system; it does not interfere with the action of other medicines; it does not constipate; it never produces giddiness, head-ach, or disturbed viscera; it does not produce nor increase determination to any particular organ, or to any diseased or irritable viscus.

4. It promotes all the secretions, and seems to act equally and generally on the whole capillary system, without depressing the vital powers, which it rather sustains meanwhile.

5. Its action is maintained by application to blistered surfaces.

Dr. O'Shaughnessy observes, that the muriate of narcotine possesses powerful febrifuge and antiperiodic properties, but it does not produce narcotism, does not constipate the bowels, and never produces in fever cases the distressing head-ach and restlessness which so commonly follow the administration of quinine, and so often render its use uncertain, if not absolutely dangerous. The narcotine, is moreover, proved to be a powerful sudorific, perhaps the only one with which we are acquainted, which acts without producing either nausea or excitement.

Dr. O'Shaughnessy prepares the muriate of narcotine by the following process, which appears to be simple and economical, and, so far as we are aware, new.

"Take of Bengal opium, 2 lbs. alcohol, 20 lbs. Rub them well together in a large mortar, adding the spirit by degrees, until the opium is exhausted of its soluble parts. Decant the solution, and press the insoluble part. To the alcoholic solution add as much ammonia as renders the liquid slightly turbid. Distil from a common alembic, till 15 lbs. of the alcohol are recovered. Draw off the fluid in a still, and set it aside to cool. On cooling, it deposits a mass of coloured crystals, composed of narcotine, meconate of ammonia, and resin. Wash with water, which dissolves the meconate of ammonia; and then with one quart of water and one drachm of muriatic acid, which dissolves the narcotine, and leaves the resin;—filter. The solution, which is of a rosy colour, is to be evaporated to dryness. The muriate of narcotine thus prepared is a transparent resinous mass, of a rosy colour, brittle vitreous texture, very soluble in distilled water and spirits, and intensely bitter.

A beautifully crystalline muriate of narcotine may be prepared by precipitating the muriate thus made by ammonia, and dissolving the precipitate in boiling alcohol, from which the narcotine separates in fine crystals, as the solution cools. The crystallized narcotine, placed in a tube, and subjected to the influence of a stream of muriatic acid gas combines with the acid, while it retains its original crystalline form. But this process, though more elegant, is too expensive and elaborate for general use, and the non-crystalline muriate is just as valuable as the more beautiful product now described.

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* *Quarterly Journal of the Calcutta Medical and Physical Society*, July, 1838.

POISONING WITH ARSENIC.*

Louis Mercier, the father of several children, one of whom was of weak intellect, espoused a second wife, named Mary Chambelland. The latter was very frequently heard to express her disgust at being compelled to live under the same roof with the idiot boy, whose habits were extremely unclean and revolting. On one occasion the father was heard to say, in reply to some recriminations on the part of his wife, "Never mind, it will soon be over." On the 13th of December last, Mercier purchased an ounce of arsenic at an apothecary's shop. On the 15th, his son Nicholas was seized with vomiting. This continued for several days, and the boy expired on the 22nd. No medical aid was demanded; the child was attended by his father and stepmother alone: none of the matters vomited up were recovered.

At the trial of the father, which took place in November last, at the local assizes, the following documents were read by the Attorney General:

1. A report from the medical men who had been ordered to exhume the body fourteen days after death. They discovered acute inflammation, with ulceration in the intestinal canal, and concluded that the deceased Nicholas Mercier, had been destroyed by some irritant poison.

2. A report from MM. Séne, Pagen, and Fleurat, chemists, who had carefully examined the intestinal canal of Mercier without finding the least trace of any poisonous substance.

3. A medico-legal consultation from MM. Orfila, Devergie, and Ollivier, showing that the experiments of MM. Séne, &c., had not been pushed far enough, and requesting that the body might be sent to Paris for further examination.

4. A report from MM. Orfila, &c. showing that a certain quantity of arsenic had been extracted from the liver and members of Nicholas Mercier.

5. Two reports from MM. Orfila, Devergie, and Leseur; and from MM. Pagen, Séne, and Fleurat, showing that no arsenic was contained in the ground where the body of young Mercier had been buried.

After the reading of these reports, M. Orfila declared his opinion that Nicholas Mercier had died from poison, and in support of his opinion stated, at length, the following reasons:—

1. Up to January last, chemists were in the habit of merely examining the matter vomited, those found in the intestines, and the intestinal canal itself, if they discovered the presence of arsenic, and if the morbid appearances, &c., corresponded, then they concluded the case to be one of poisoning: on the contrary, if they did not find arsenic in the intestinal canal, they simply stated that no poisonous substance was discovered; and, sometimes, when the symptoms and morbid appearances were not in accordance with the idea of poisoning, they spoke very doubtingly of its occurrence or possibility. By the publication of M. Orfila's memoir on arsenic, it has been shown that arsenic may be found in the organic tissue, particularly in the liver of persons poisoned with that metal, even when no trace of it can be discovered in the digestive canal. M. Orfila's first experiments were confined to dogs, but he had soon opportunities of confirming his opinion by experiments on the human subject. Considerable quantities were found in the flesh and viscera of Soufflard, who poisoned himself with arsenic while on his trial for murder. M. Lorrin poisoned himself with arsenic, and numerous traces were found in his liver. Hence it is well established, that in case of poisoning with arsenic the metal is absorbed, and may be discovered in the tissues, while, by *the same processes*, not a particle of arsenic can be discovered in the same tissues if the person have not taken any arsenical preparation.

2. M. Orfila does not admit, with those physicians who examined the body of Mercier, that the symptoms and morbid appearances, taken together, are sufficient to prove that the deceased met with his death from poison; for it is a rule in medical jurisprudence, that such a conclusion should never be drawn unless the poison has been actually demonstrated by chemical means.

With respect to the report of MM. Séne, &c., and the non-discovery of arsenic in the intestinal canal, M. Orfila thinks that the latter named chemists are not to blame, because the method of experimentation which he (M. Orfila) adopts had not been published at the time of their report.

3. The experiments performed by MM. Orfila, Devergie, &c., demonstrated that the body of Mercier contained arsenic in addition to that which is naturally found in the human body. A certain quantity of the metal was obtained from the liver, limbs, and the putrid fluid of the barrel in which the body was forwarded to Paris. M. Orfila presented this metallic arsenic to the jury on a number of porcelain plates, and with it some arsenic extracted from the carcase of a dog poisoned with arsenious acid. It might, perhaps, be objected, that as the body of the deceased had lain for four months in the ground, some arsenic might have been generated by decomposition; to clear up this point two bodies were exhumed and analyzed, but not a trace of arsenic was discovered in them.

4. M. Orfila answered, by anticipation,

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* From the *Journal des Debats.*

objections which might be offered to the preceding observations.—1. The tests might have contained arsenic;—they neither did, nor could they have contained a grain of this metal.—2. If the body contain naturally some arsenic, how can it be decided that that found in the body of Mercier was not part of the natural arsenic? In the normal state, when the liver is treated with nitric acid, it never furnishes arsenic, but the liver of Mercier did.—3. But, perhaps, the earth of the burying ground contained some arsenic, which may have passed into the body by imbibition. At four different times several pounds of the earth, which surrounded the body, were analysed, and on one occasion only was a very slight trace of arsenic discovered, and even here it was necessary to employ boiling sulphuric acid. Besides, bodies buried in grave-yards, which contain a much greater quantity of arsenic than that of *Villery-sur-Tisle*, do not contain arsenic.

From these considerations, M. Orfila concluded that Nicholas Mercier died from poisoning with arsenic.

M. Devergie having explained his reasons in a clear manner, expressed a similar opinion.

On the part of the defence, M. Raspail was brought forward to combat the opinions of MM. Orfila and Devergie. From the imperfect manner in which the remarks of M. Raspail are reported in the *Journal des Debats*, we find some difficulty in exactly seizing the objections which he put forward. M. Raspail affirmed, that if the chemists who first examined Mercier's body did not find any arsenic in the intestinal canal, it was because there really was no arsenic there. The examination of the earth surrounding the body, was imperfect. Instead of analysing a few pounds, the whole should have been analysed. The spots on the porcelain plate have, indeed, the appearance of arsenic, but nothing proves that they are. Several other substances will afford the same appearances. (Here the President interrupted M. Raspail to ask the name of such substances, but the latter refused to specify them.)

M. Orfila now refuted the objections of M. Raspail, one by one, and concluded by saying, that "if M. Raspail could name a single body, other than arsenic, in which were assembled the four properties mentioned in the report, he would instantly tear his report in pieces and abandon his opinion."

To this M. Raspail replied, that certain volatile oils, mixed with a phosphate, give a yellow precipitate, with the nitrate of silver, similar to that of arsenic. M. Orfila denied this. Besides, arsenic, when treated with nitric acid, gives a brick-red precipitate, and not a yellow one, as M. Raspail affirmed.

After this scientific encounter, MM. Orfila, Devergie, &c., were sent to examine, in presence of M. Raspail, the nature of the spots supposed to be arsenical on the porcelain plate. This was done at the laboratory of the Academy, and on the following day M. Raspail was compelled, although reluctantly, to acknowledge that the spots were arsenical. The father of Nicholas Mercier was, therefore, found guilty of having poisoned his son, and condemned to the galleys for twenty years.

POISONING BY THE EXTRACT OF ACONITE.*

Dr. Pereyra and his colleagues of the hospital at Bourdeaux have, for years past, been much in the habit of employing the alcoholic extract of the aconitum napellus, in the dose of from 3 to 10 grains during the 24 hours, in chronic rheumatism, neuralgia, certain forms of paralysis, &c. No accident had been known to result in their practice from its use, until about three months ago, when some fresh extract had been obtained from the *pharmacien:* of this, five grains had been given to three of the patients. One of these died at the expiry of three hours after taking it; and the other two became alarmingly ill. It would appear that, in about a quarter of an hour after the dose had been administered, they experienced the usual effects of the medicine—viz. tremors in the muscles of the thighs and arms, and a pricking starting sensation in various parts. But these symptoms did not cease, as they had usually done before, in a few minutes; they rather increased in force, so as to approach almost to convulsive movements. A sense of great irritation along the throat, followed by severe vomitings, now came on.

During the accession of the convulsions, the patients became quite unconscious; when these ceased, the speech was restored, but the sight was still confused, and a most intolerable scorching head-ach supervened. The surface was covered with a cold sweat, and the pulse was slow and irregular, but the respiration was short and hurried. On applying the ear over the region of the heart, it seemed that the impulse or stroke of its apex against the parietes of the thorax was often interrupted, while the ventricles still continued to expel their contents; for the pulse at the wrist not unfrequently beat thrice for one beat of the heart. Dr. Pereyra was struck with the marked resemblance of the symptoms, in many respects, with those of Asiatic Cholera.

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* *La Française Lançette.*

It was evident that the immediate cause of danger was *un defaut d'innervation* in the circulatory and respiratory systems; and therefore that the main object to be attempted was to stimulate their action through the medium of the nervous system. Heat and mustard poultices were applied to the extremities, the spine and precordial region was rubbed with tincture of cantharides, and ammonia in a strong decoction of *huaco* (a plant which had been used with advantage in several cases of cholera) was exhibited at short intervals. By continuing the use of these means for some time, all the unpleasant symptoms gradually abated, and finally ceased altogether.

ON THE EMPLOYMENT OF A NEW VEGETABLE, MONESIA, IN MEDICINE.*

BY DR. G. J. MARTIN ST. ANGE.

A vegetable substance, called *monesia*, has lately been imported from South America, in the form of hard thick cakes, weighing about five hundred grammes (9215 grains). These cakes are composed of the extract, prepared in the country, from the bark of a tree whose botanical name is not known. M. Bernard Derosne, the druggist who introduced it, informs me that some travellers call the monesia bark *goharem*, and others *buranhem.* The naturalists who have examined this think that the tree which furnishes it is a chrysophyllum.

The extract is of a deep brown, and very friable; when broken it looks like a well-roasted cacao nut. It is entirely soluble in water, and its taste, which is at first sugary like liquorice, soon becomes astringent, and leaves behind a well-marked and lasting acid taste, which is particularly felt at the tonsils.

The bark of the monesia is smooth and greyish, like that of the plane-tree, with this difference, that it is much thicker, that its fracture is imbricated, and that its sweet taste forms a strong contrast with the bitterness of the thin laminæ which are detached from the plane.

Chemical analysis of the bark of the monesia, and of the imported extract, according to MM. Bernard Derosne and O'Henry, has demonstrated the presence of the following soluble principles: — 1. Chlorophylle; 2. vegetable wax; 3. a fatty and crystallizable matter; 4. glycyrrhizine; 5. an acrid and somewhat bitter substance; 6. a little tannin; 7. an unexamined organic acid; 8. a red colouring matter, resembling that of cinchona; 9. phosphates of lime, with organic acids.

The pharmaceutical preparations which have been made with this substance are— 1. an aqueous extract; 2. a syrup, containing thirty centigrammes (5½ grains) in the ounce; 3. a hydro-alcoholic tincture, containing two grammes (37 grains) per ounce; 4. chocolate, containing thirty centigrammes (5½ grains) in each cake weighing three decagrammes (7 drachms, 49 grains); 5. an ointment, containing an eighth part of its weight of extract; 6. monesine, being the acrid substance mentioned in the analysis.

The extract contains about eight per cent. of glycyrrhizine, and twenty per cent. of acrid matter.

The following accounts of monesia are already in existence:—1. A manuscript memoir, which is in the hands of the commissioners appointed by the Academy of Medicine. 2. A synoptical table, giving the analysis, some pharmaceutical preparations, and the medicinal preparations of monesia. 3. A very minute summary of these two papers, entitled, "Account of Monesia." 4. An article inserted in the *Bulletin Therapeutique.*

I will now give a succinct account of the facts which have been published, before mentioning the results which I have obtained myself.

The medical cases in the synoptic table have been drawn up by several physicians in Paris; they give the nature of the disease, the sex, the profession, the age and the constitution of the patient; the mode of treatment, the duration of the disease, the termination; and, lastly, the remarks suggested by each method of treatment.

M. Alquié, professor of pathology at the Val-de-Grâce, found—

1. That of forty-two soldiers attacked with diarrhœa of different degrees of severity, thirty-six were cured in twelve days; twenty-four by the extract of monesia given in pills, in the dose of from eighty centigrammes to a gramme (14½ to 18½ grains) a day; and twelve by the tincture, administered as a clyster, in the dose of eight grammes (147½ grains) in two hundred and fifty grammes (4607½ grains) of bran water.

2. That in two cases of menorrhagia, the extract and the tincture of monesia given internally soon calmed the pain, and stopped the uterine discharge.

3. That in four women attacked with profuse leucorrhea, the extract of monesia given internally, and the diluted tincture injected into the vagina, were beneficial.

4. That in two cases of hæmoptysis, where bleeding, ligature of the limbs, and ordinary astringents, had been employed without advantage, the extract of monesia succeeded completely; and that several

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* *Gazette Médicale.*

chronic cases of bronchorrhœa were benefitted by the syrup of monesia, which was sometimes combined with opium.

M. Baron cites — 1. A very remarkable case of chronic inflammation of the vagina, of a syphilitic kind. No advantage had attended the previous use of baths, local bleedings, emollient and astringent injections, the nitrate of silver; a year later the diluted supernitrate of mercury, sulphurous baths, leeches, and the repeated application of blisters and sinapisms, were equally useless. In spite of these remedies the discharge from the vagina became more abundant. Injections were then used containing thirty grammes (552 grains and 9-10ths) of the extract of monesia in a hundred and fifty grammes (2764½ grains) of water. In eight days the discharge was much diminished, and in three weeks the patient was cured. The discharge returned in a month, but again yielded to the same injections.

2. A case of leucorrhœa. The discharge was copious, of a yellowish white colour, and accompanied with pains in the groins and lumbar regions; baths, leeches, and injection of mallow water and laudanum, had produced no benefit. Injections of monesia, in the proportion of thirty grammes (552 grains and 9-10ths) to a hundred grammes (3317½ grains) of water, were employed once a day, and the patient was cured in a fortnight.

3. Several cases of diarrhœa, which resisted the means generally used, were cured by the extract of monesia given internally, and clysters containing the tincture, in different proportions.

M. Buchez has employed the extract of monesia, and he has remarked, that it delayed the progress of caries in the teeth, and that, when combined with opium, it often soothed the pain more effectually than the opium alone. He recommends the employment of the tincture to keep the gums in a healthy state.

M. Daynac speaks of the good effects he has obtained from the preparations of monesia (the syrup, lozenges, and paste) in several cases of the chronic catarrh of the old, in dyspeptic persons, and in the third stage of phthisis. He also cites remarkable cases of scrofulous engorgement, much benefited by the use of the tincture of monesia, in the dose of eight grammes (147½ grains) daily, continued for a greater or less time. Lastly, the extract of monesia in pills, in the dose of from sixty to ninety centigrammes (11 to 16½ grains), has been very serviceable in uterine discharges.

M. Laurand speaks of a well-marked case of scurvy which he cured with monesia. The patient had had frequent epistaxis, which had several times required the nostrils to be plugged. He was made to inspire acidulated water by the nostrils, containing thirty grammes (552 grains and 9-10ths) of the tincture to a pound of water. This stopped the hæmorrhage; but when the same thing had been done with acidulated water not containing monesia, it had not succeeded. The patient also took from a gramme to a gramme and a half (18½ to 27¾ grains) internally every day. The same physician has ascertained the efficacy of monesia in a great variety of circumstances, particularly in gangrenous eschars on the sacrum.

M. Manec has employed the different preparations of monesia with success:—1. In a man who, for six years, had had a large serpiginous ulcer in the bend of the groin, which had resisted every kind of treatment, and which rapidly improved under the use of monesia ointment.

2. In a great number of aged women labouring under diarrhœa, and in persons affected with chronic bronchitis.

M. Monod has furnished some very interesting cases; some of ulcers of the nose, and others of affections of the intestinal canal. The ulcers were dressed with the powdered extract, and cured in a few days. In other cases the extract given in pills to the amount of from 60 to 120 centigrammes (11 to 22 grains) daily, was perfectly successful.

M. Payen, who has employed monesia in a great number of cases, has seen a patient in whom leucorrhœa was considerably increased by this medicine, administered two different times; the monesia was then tried as an injection, and the discharge, which had hitherto resisted every remedy, disappeared, and did not return. The same practitioner cites two cases of uterine hæmorrhage, where the patients were obliged to keep their bed for a fortnight at each menstrual period, and in which the monesia brought back the discharge to its healthy standard. Lastly, M. Payen has succeeded in cicatrizing an ulcer in the lower jaw, which, for ten months, had resisted every kind of treatment, both internal and external; and in healing ulcerated chilblains, by means of the ointment and the powdered extract of monesia.

Thus we see that monesia has been employed both externally and internally. It has been frequently administered during the chronic stage of bronchitis, usually alone, but sometimes combined with opium, and in the greatest number of cases it has seemed to act advantageously upon the disease, the expectoration and respiration being rendered more easy.

In many cases where pulmonary hæmorrhage was prolonged, having resisted various and generally efficacious remedies, the extract of monesia has stopped the spitting of blood.

In weakness of the stomach monesia has a very favourable influence on digestion, and secondarily on nutrition. This medicine has also been very beneficial in chronic enteritis; it has chiefly succeeded against diarrhœa, from whatever cause it arose.

The efficacy of monesia taken internally has been less marked in leucorrhœa than in diarrhœa; yet it has been useful in the majority of patients who have taken it; but injections have been more advantageous.

In every case of uterine hæmorrhage where monesia has been given, it has succeeded in moderating and suppressing the discharge more readily than the other remedies which had been previously used.

Monesia has also been of great advantage in scorbutic and scrofulous affections, and has always benefited ulcers of a bad character, whether the ointment, or the pure extract powdered, or the acrid substance contained in it, has been employed.

Such is the compendium of the cases hitherto published, with the exception of four by M. Forget, which are the basis of the article that he has published in the *Bulletin Thérapeutique*, and which, as he says himself, neither tell for nor against monesia.

We may say, therefore, generally, that monesia shews its maximum of power in diseases of the digestive organs, in hæmoptysis, uterine hæmorrhage, and ulcers of the skin, or of the mucous membranes, at their origin. A remarkable point in this remedy is, that although it is gifted with energetic powers, and has acted upon the tonsils or upon ulcerations as an active stimulant, it has never irritated the stomach as tonics (?) properly so called, often do. In order to form a due estimate of its relative activity, we must not forget that it has always been employed after the exhibition of other remedies.

I now come to my own cases, the general results of which may be stated as follows:—

Monesia, when exhibited internally, in the dose of from 75 to 125 centigrammes (14 to 23 grains) of the extract daily, for eight or ten days, whether in the form of pill, tincture, or syrup, has an immediate effect upon the digestive passages, and quickens the action of the stomach in a very remarkable manner. If the dose of the remedy is pushed to four grammes (74 grains) of the extract daily, for fifteen or twenty days, the appetite increases, but the patients sometimes experience a feeling of heat in the epigastrium: tenesmus and obstinate constipation may also come on; hence its action upon the digestive tube should be moderated by diminishing the dose according to the effect produced, and administering emollient or laxative clysters, as may be required.

Monesia ointment may be employed externally upon sores, in every case, but with more or less success, according to circumstances: thus I have seen it succeed in large and excessively painful ulcers, arising from the action of blisters, in sores produced by burns, in varicose ulcers and old wounds; in a word, whenever the sore is painful, and depends on a merely local affection. When this is not the case, and the ulcer is kept up by syphilis, scrofula, scurvy, or cancer, it is impossible to effect a permanent cure by merely applying the monesia ointment, washing the sores with the tincture, or sprinkling them with the extract or acrid principle contained in it. Yet, by employing these different preparations in a proper manner, we may hope to modify the sores, and even to cure them for a time. Generally speaking, the ointment, when applied to a sore, calms the local pain; the tincture thus used, produces a sensation of heat, which ceases immediately; the powdered extract more or less excites the sore, and the acrid principle in powder, when well prepared, has a special activity greater than caustic: hence it is a powerful remedy against fungous or atonic ulcers of a bad appearance; but as soon as these sores become painful, and especially when they are covered with a whitish pellicle, the use of the acrid principle should be discontinued; for it is usually this pellicle which, by preserving the surface of the sore from contact with the air, and perhaps by becoming partly organized, produces cicatrization.

I have said expressly, that it is impossible to obtain a lasting cure of syphilitic or cancerous sores by the mere external use of this remedy; in such cases, therefore, we must have recourse to a specific treatment capable of acting on the system. I have found that in order to effect the cure of scrofulous ulcers, the monesia must be employed internally, for five-and-twenty or forty days, and even longer, according to the case; and this in large doses, such as four or five grammes (74 or 92 grains) of the extract daily, in the form of a pill, tincture, or syrup. In this way I have succeeded in curing or benefiting several scrofulous patients. The following are two remarkable examples:—

Case I.—A young man, of 17, a printer, born of very healthy parents, came to see me in February, 1839, to have the little-finger of his left hand amputated. On looking at the diseased parts, I saw it was a scrofulous affection of only eight months' standing. The first phalanx was much swelled, the soft parts covering it were livid, and there were three fistulous openings in the skin; two corresponding to the dorsal part of the phalanx, and the third to its palmar surface. They were surrounded with callous vegetations of a brownish colour, and communicated with one another by means of subcutaneous fistulous passages. By introducing a blunt probe into the sores, it was easy to reach the bone of the finger, and to ascertain the detachment of the skin and the caries of a portion of the phalanx. The suppuration was serous, yellowish, of a faint odour, and contained some flakes of a substance which seemed carious. Strong pressure of the diseased tissues occasioned hardly any pain. On the back of the hand and the left elbow there was also a swelling of the skin and of the subjacent parts, looking like the little-finger. The swelling and livid patch extended from the elbow to the inside of the bend of the arm; its centre was ulcerated, and covered with a thick crust, which, according to the patient's report, was renewed every two or three days.

I began by sprinkling the acrid principle of monesia on the small sores of the finger. After some days' dressing, the swelling of the soft parts began to diminish, and at the end of about twenty days the fistulous openings entirely closed. The diseased tissues at the back of the hand then ulcerated, and the acrid principle being employed as above-mentioned, in a few days a cure was effected. There remained only the sore upon the elbow, which had been purposely dressed with cerate. It continued to suppurate, and to be covered from time to time with a fresh crust.

The patient was in this state when I presented him to Dr. Bailly, who had been commissioned by the Academy to report on the effects of monesia. The affection appeared to him to be evidently scrofulous, and the result obtained to be very satisfactory. The disease, however, soon reappeared; the fistula of the finger began to suppurate again; there was swelling and livid redness of the soft parts, with engorgement and induration of the back of the hand; the sore on the elbow became larger and deeper. The patient now entered the hospital of St. Louis, where he had internal medicines as well as fumigations, sulphurous baths, &c. In a month he came out, with the diseased parts in a worse state than ever. I now prescribed the internal use of monesia—namely, twelve pills, each containing twenty centigrammes (3½ grains), and two spoonfuls of tincture. The sores were dressed with common cerate. Under this treatment the patient was cured in thirty-five days. Nevertheless, he continued to take five pills a-day till the fiftieth day.

Since July, the diseased parts have been constantly improving, and a lasting cure may be hoped for. It is right to state, that in this case the preparations of monesia did not cause tenesmus or constipation, although the patient did not employ any purgative; the only thing he complained of was too much appetite.

Case II.—M. —, æt. 40, who had always enjoyed perfect health, came to France two years ago, and perceived, in the month of April, 1839, that he had an indolent tumor in the left inguinal region. Several physicians of the capital were consulted, and they ascertained that it was a swelling of one of the superficial lymphatic glands, situated in the bend of the groin. On the 21st of the same month, I was also consulted by the patient. The diagnosis was not difficult, but the point was to know how the tumor would turn out. My prognosis was favourable, like that of all the other physicians, excepting M. Lisfranc, who thought that the swelling of the gland, though slight, depended on a general affection. On the 2d of May the groin continued to swell, and from that time all the other glands of that part, as well as of the left iliac fossa, swelled considerably; and this was soon the case with those of the opposite side. Twenty pages would scarcely suffice to tell all that was prescribed by the physicians, and patiently submitted to by M. ——. No remedy was of any use, except for a short time; and I therefore proposed monesia, in the dose of 150 centigrammes (28 grains) of the extract a day. The patient at this time was extremely weak, ate but little, and was feverish every day. In a week, digestion had improved; there was a sensible increase of strength, and no fever. The sores were dressed with the monesia ointment. In consequence of these results, I tried to augment the dose of the medicine, and, besides the extract, the patient took two spoonfuls of the tincture, and from four to six of syrup in an infusion of hops. As to the sores, which obviously grew better, the same dressing was continued morning and evening, and every thing promised a speedy cure, when constipation and a most painful tenesmus came on, which obliged us to suspend the treatment. In a few days the sores became larger and larger, fungous, and of a bad appearance.

The dressing was then changed—extract of monesia in powder and the tincture being employed; but these remedies were almost as useless as a host of others which were successively tried. It then seemed clear to me that the internal use of monesia had alone produced the improvement, and its use was accordingly resumed, taking care to make laxatives a part of the treatment. For this purpose the patient had two glasses of Enghien water every morning, and an emollient clyster. In a fortnight, the good effects of the monesia were again perceived; and this was the more to be attributed to its internal use, as the dressing had been performed with simple cerate.

At present, the swelled glands of the groin are softening and disappearing, without any suppuration. Those of the iliac fossa are diminishing in size; the sores have cicatrized, and the disease, far from attacking the lymphatic glands of the other parts of the body, as is commonly the case, is localized, and is much lessened. The patient eats with a good appetite, sleeps well, and takes exercise three hours a day, which makes us hope for a fortunate termination of the disease.

Another result which I have obtained from the use of monesia, and which has been observed by other practitioners likewise, is its action upon the uterus in cases of metorrhagia. I will give two instances:—

Case III.—Madame ——, of a plethoric constitution, was attacked, after the catamenial period, with a flooding, which obliged her to keep her bed and seek for advice. After having employed cold drinks, ligatures on the limbs, cupping-glasses, and other revulsives, without success, I made the patient take five monesia pills, each containing 20 centigrammes (3 grains and 3-5ths). The next morning she was very weak; the skin burning, the pulse scarcely perceptible, the face pale, and the eyes sunken. She had shivering fits from time to time, a sensation of weight in the loins, transient colic pains, and headach, with sleepiness; and what was more, the hæmorrhage did not diminish. I then prescribed twelve pills of extract of monesia to be taken every hour. The discharge stopped the same day, and never returned.

Case IV.—Madame ——, aged 20, who had been married six months, had frequent pains in the loins; and in a few days a flooding came on, which obliged her to keep her bed. The hæmorrhage increased, as soon as the patient got up; there was no pain in the abdomen, and no constipation; the pulse was weak and irregular, and from 76 to 80 in a minute. Revulsives, cold and acidulated drinks, clysters of cold water, and compresses dipped in iced water and applied to the thighs, had no effect. The ergot of rye was then employed, but as this excited vomiting, it was discontinued, and pills of the extract of monesia were ordered to be taken every hour, until an effect was produced. After fourteen pills the hæmorrhage ceased. The patient then took cold broth at intervals, and in spite of the lightness of this food, the discharge returned in the evening with violence, and again ceased after the exhibition of ten monesia pills.

On the following day, the dose of the medicine was diminished to 75 centigrammes (14 grains), and in six days the patient was quite well.

Quite lately, I employed the acrid principle in powder, in the dose of 15 centigrammes (2 grains and 7-10ths), taken in a prune; it was to stop a uterine hæmorrhage, which had suddenly come on during the night; the discharge ceased the same day. But as this case stands alone, additional facts are necessary to prove the power of the acrid principle under such circumstances. In every case, monesia acts in a remarkable manner upon the uterus, when it is not in its natural state. This new medicine may be used in different ways, and it acts on different organs, particularly when they require to be strengthened without too much excitement.

This is confirmed by the following passage from M. Buchez:—

"I have tried the extract of monesia," says this skilful practitioner, "in different affections of the mouth, particularly in inflammation of the gums, and uniformly with advantage. Its application produced a good effect, by almost instantaneously soothing the pain, which often accompanies inflammation. This mode of treatment I have found very successful in the scorbutic swelling of diseased gums, and it has removed affections which had previously resisted other remedies. When caries of the teeth is attended with pain, the application of monesia is sure to remove it in a few moments."

When all the ascertained facts are compared together, one is struck by the very peculiar tonic action of monesia on every organ. As its powers have been tried in more than four hundred cases, we may be allowed to consider monesia as a very useful remedy, under several circumstances, particularly scrofulous affections and uterine hæmorrhage. Hence the art of healing has made a real acquisition; nor is it to be imagined that this tonic has any identity of effect with those already known: quite lately a tannin ointment, and monesia ointment were tried and compared with each other, and the advantage was on the side of the latter. Moreover, it is clear that every medicine acts in its own way, and that there cannot be two whose special effects are the same. Well-informed practitioners know that one purgative cannot be indifferently substituted for another; and that every narcotic has not, in the same degree, the power of soothing and producing sleep; that the action of the various tonics is also very different; and that the general effects of medicines are like the difference of faces; many resemble each other at the first glance, but none can sustain an exact comparison.

NEW TEST FOR THE DETECTION OF PREGNANCY.*

M. Nauche found that the urine of pregnant women contains a particular substance, which, when the urine is allowed to stand, separates and forms a pellicle on the surface. M. Eguiser, from an extensive series of observations, has confirmed this fact, and found that the *kisteine*, as this particular substance has been called, is constantly formed on the surface of the urine of women in a state of pregnancy.

The urine must be allowed to stand for from two to six days, when minute opaque bodies are observed to rise from the bottom to the surface of the fluid, where they gradually agglomerate, and form a continuous layer over the surface. This layer is so consistent that it may be almost lifted off by raising it by one of its edges. This is the kisteine. It is whitish, opalescent, slightly granular, and can be compared to nothing better than to the fatty substance which swims on the surface of soups, after they have been allowed to cool. When examined by the microscope it has the aspect of a gelatinous mass, without determinate form; sometimes cubical shaped crystals are discovered on it, but this appearance is only observed when it has stood for a long time, and are to be regarded as foreign to it. The kisteine remains on the surface for several days; the urine then becomes turbid, and small opaque masses become detached from the kisteine, and fall to the bottom of the fluid; and the pellicle soon becomes destroyed.

The essential character of the urine of pregnancy, then, is the presence of kisteine; and the characters of the pellicle are so peculiar, that it is impossible to mistake it for anything else. A pellicle sometimes forms on the surface of the urine of patients labouring under phthisis, abscess, or catarrh of the bladder, but may be easily distinguished by this circumstance, that it does not form in such a short time as the kisteine, and that, in place of disappearing, as this last, in a few days, it increases in thickness, and at last is converted into a mass of mouldiness. There exists, likewise, a very marked difference between its mucous aspect and that of kisteine—a difference which it is difficult to describe, but which is easily recognized.

Kisteine appears to exist in the urine from the first month of pregnancy till delivery. M. Rousseau has even recognized it in the urine of a few gravid animals.

NEW SIGN OF DEATH BY HANGING.*

M. Duvergie proposes two additional tests, which he thinks will be of much service to the medical jurist in cases where exists any dubiety as to whether a body found hanged has been so during life or after death. He has found in all cases of death by hanging "congestion of blood in the organs by which the generative act is accomplished," and "the existence of spermatic animalculæ in the urethral canal." The first of these has been frequently remarked before; but the last merits notice. He has been able to detect, with the aid of the microscope, spermatic animalculæ both in the semen which has been ejected upon the linen of the deceased, and also in the portions of that fluid still remaining within the canal of the urethra. He has even detected these animalculæ in seminal stains which had been on linen for no less a period than six months; but in this last case many of the animalculæ were found to have lost their tails, in consequence of the manipulations preparatory to their being subjected to the powers of the microscope.

He suggests the examination of spermatic stains by the microscope as a test of far greater value than any which chemistry is able to furnish. He advises that the fluid be pressed out from the urethra in preference to laying that canal open, as in this way the fallacy which might arise from the intermixture of any portions of blood is avoided. The fluid expressed is placed between two plates of glass and subjected to the microscope, when the spermatic animalculæ, if present, may at once be detected.

[Plenty of this TEST, *if it be a test*, was taken from dead bodies (*not hanged*) by Dr. John Davy. See a long paper in his RESEARCHES, vol. ii.]

POISONING OF RABBITS PRODUCED BY THE SULPHATE OF QUININE, ADMINISTERED IN A FULL DOSE.

BY M. DESIDERIO.

This memoir contains the result of nine experiments made on rabbits. In the first two, 40 grains produced death in less than five hours.

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* *L'Experience*, July 25, 1839.

* *Annales d'Hygiene Publique*, January 1839.

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THE CHEMIST.

I. CHEMISTRY.

ON THE THEORY OF SUBSTITUTIONS IN CHEMISTRY, PROPOSED BY M. DUMAS.*

IN A LETTER TO M. PELOUZE FROM M. BERZELIUS.

You will perhaps permit me to return once more to M. Dumas's theory of substitutions, especially after the new development that this skilful chemist has lately given it, a development which, according to him, threatens to overturn the theory of chemistry in general, and especially electro-chemical notions. You remember that in a preceding letter, I declared my opinion, that the application which has been made of the theory of substitutions, in considering chlorine, which takes the place of hydrogen, as acting the same part as the latter, is contrary to the principles of the science, and I quoted some examples on this subject, which I think prove it in an unequivocal manner. In begging you to communicate the contents of this letter to the *Académie des Sciences*, I hoped that M. Dumas would have the goodness to explain under what point of view he regards the theory in question. He has, indeed, complied with this request, and in a manner which, with the exception of some details foreign to the question, has entirely satisfied me.

In the *Comptes Rendus* of 1838, (1ère semestre, p. 699 and the following pages,) M. Dumas has disclaimed this explanation of the theory of substitutions: "If I am made to say that chlorine takes the place of hydrogen in such a way that the former acts the same part as hydrogen, an opinion is imputed to me," says M. Dumas, "against which I protest, for it is opposed to all that I have asserted on these matters. The theory of substitutions merely asserts the simple affinity between hydrogen and the chlorine which takes its place in equal volume. It is an empirical law which deserves our attention only as long as it holds good, and if any one has made it of more importance it is not my fault."

This assertion of M. Dumas is in perfect harmony with my way of thinking; what has led to a mis-statement of his opinion is probably the improper denomination of *theory of substitutions*, for an empirical law is not a theory, and the word 'substitution' has long since been used in chemistry to to signify the replacing [*remplacement*] of one body by another which acts the same part as this body, and M. Dumas has lately changed this word for another, which is very well chosen, *metalepsie*, signifying replacement [*remplacement.*]

In the *Comptes Rendus* of 1839, (1ère semestre, p. 909), M. Dumas has more lately given a new explanation of this theory, but quite opposed to that just mentioned. He made the beautiful discovery that crystallizable acetic acid $C^4 H^6 O^3 \underline{\dot{H}}$, exposed to the light of the sun in an atmosphere of dry chlorine, is gradually decomposed, and that an equal volume of chlorine completely takes the place of the hydrogen. A new acid composed of $C^4 H^6 O^3, \underline{\dot{H}}$, is the result of this action, some of whose properties he has described.

The conclusions which M. Dumas draws from this fact are the following: the chlorine in taking the place of the hydrogen atom for atom, *acts the same part as the hydrogen;* an acetic acid is the result of this, which differs only from the other in containing six atoms of chlorine instead of six atoms of hydrogen, and on this account he gives it the name of *chloracetic acid.* It possesses the same properties as the ordinary acid, so that if we know the properties of the latter, we equally know those of chloracetic acid. This is caused by the properties of a body depending rather on the type of the composition than on the particular characters of the element which has been exchanged. In organic chemistry, says he, there exist certain types, which are preserved even when equal volumes of chlorine, bromine, or iodine have taken the place of the hydrogen which they contain. He infers from this that there are two great leading principles in chemistry, which are *isomorphism* in mineral chemistry, and *substitution* in organic chemistry. He supposes that the principles originate from the same cause, and that in due time they may be generalised under one common expression.

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* From the *Ann. de Chim. et de Phys.*, vol. lxi. p. 137; as given by the *Philosophical Magazine.*

M. Dumas adds that neither isomorphism nor the theory of substitution harmonizes with electro-chemical opinions, and as these latter have not, according to him, the property of yielding to facts or of explaining or predicting them, he dispatches the electro-chemical theory by saying, " It must be admitted there is nothing in it."

This is certainly a complete revolution in the state of chemistry.

When questions of such importance to science are treated of, the love of truth should ensure a mature examination of the propositions of the author of such a revolution, for the purpose of engaging us on his side if he is right, and of opposing him if he is wrong.

One of the great advantages of the theory of substitutions over electro-chemical opinions seems to be, that the type of composition preserves the same properties after the exchange of hydrogen for chlorine.

Let us then examine the few properties of chloracetic acid which M. Dumas has described, and compare them with those of acetic acid. It will be seen that these two acids differ infinitely more from each other than do formic acid and acetic acid.

ACETIC ACID.

Smell strong and pungent.
Liquid at common temperatures.
Solidifies at about 50° Fahr., boils at about 212°.
Specific gravity 1·06.
Potash salt deliquescent.
Æther very fluid, odour æthereal; floats on water.

CHLOROACETIC ACID.

Scarcely any smell.
Solid at common temperatures.
Solidifies at about 187° Fahr., boils at about 392°.
Specific gravity 1·617.
Potash salt unalterable in the air.
Æther oleaginous, odour like mint; sinks in water.

These two acids, therefore, have no other resemblance than that which belongs to acids in general, and it might be stated that chloracetic acid resembles sulphuric acid as much as it does acetic acid. Thus the type does not lead to an anticipation of the particular properties of an acid in which hydrogen is replaced by chlorine.

With respect to the composition of chloracetic acid, M. Dumas is of opinion that it is formed of three atoms of oxygen and of one atom of a radical composed of four atoms of carbon and of six atoms of chlorine. In examining into this composition, it is natural to inquire if other bodies which have an analogous composition are not known, and whether, M. Dumas's opinion is not equally applicable to them, for it is evident that any explanation not applicable to similar cases ought to be rejected.

Chloracetic acid is composed of carbon combined with chlorine and oxygen. There exists a numerous class of similar combinations; it is divided into three subdivisions according to the radicals combined with the chlorine and with the oxygen; these shall be considered in rotation.

1. *Simple electro-positive radicals.*—This subdivision is very numerous and well-known: it consists of the basic muriates of the ancient theory of the nature of hydrochloric acid. The general opinion, which has not been contested, is that these bodies are composed of a chloride and an oxide. They are readily decomposed and recomposed.

In applying the new theory of M. Dumas to the compound $Pb\,\underline{Cl} + 3\,\dot{Pb}$, it should be expressed by $Pb^4\,Cl^2 + 3\,O$, in which $Pb^4\,Cl^2$ is a radical composed of lead and chlorine.

I am persuaded that M. Dumas would protest against this extension of his views; but if they are true, however, it is requisite to do so, and to be consistent, we must go still further, and consider the salts of the oxacids as oxides of a radical composed of that of the acid and also of the base, sulphate of potash, for example, as $KS + 4\,O$.

2. *Simple electro-negative radicals.*—The number of combinations known of this class is very limited. They are to be considered under two different points of view. M. Henry Rose, who discovered the combination of chromium belonging to this class, considers it as composed of $Cr\,\underline{Cl}^3 + 2\,\dddot{Cr}$, and this manner of viewing it has been generally adopted. It has since been proposed to consider it as chromic acid in which an equivalent of chlorine is substituted for

an equivalent of oxygen. This manner of viewing it is more simple, but it is easy to prove that it is not correct, for the chloride of chromium may be replaced by other chlorides; and we have several examples of salts formed of an atom of a chloride and of two atoms of chromic acid; but the preceding hypothesis admits only a single relative number of atoms of chlorine and of oxygen, although several are known to exist. Consequently, the only admissible explanation in this class of bodies, is that of considering them as composed of a chloride and of an oxide.

The following are the only combinations of this species hitherto discovered:—

Radicals.	Formula	Authors.
Sulphur	$\underline{S}\ \underline{Cl}^3 + \dddot{S}$	Regnault.
Do.	$\underline{S}\ \underline{Cl}^3 + 5\,\dddot{S}$	
Carbon	$\underline{C}\ \underline{Cl}^3 + \underline{\dddot{C}}$*	Dumas (chloracetic acid.)
Do.	$C\ \underline{Cl}^2 + \ddot{Cl}$	J. Davy (phosgene gas.)
Molybdenum	$Mo\ \underline{Cl}^3 + 2\,\dddot{Mo}$	H. Rose.
Tungstenium	$2\,W\,\underline{Cl}^3 + \dddot{W}$	Bonnet.
Do.	$W\ \underline{Cl}^3 + 2\,\dddot{W}$	H. Rose.
Chromium	$Cr.\ \underline{Cl}^3 + 2\,\dddot{Cr}.$	Do.

You observe then that the chloracetic acid of M. Dumas is merely a combination of oxalic acid with a chloride of carbon, corresponding to the oxalic acid itself. Its acid characters will be hereafter considered.

3. *Compound Radicals.*

Radical.	Formula.	Authors.
Acetyle	$2\,C^4\,H^6\,\underline{Cl}^3 + C^4\,H^6\,O^3$	Malaguti (chloric æther.)
Formyle	$\underline{C}^2\,\underline{H}^2\,\underline{Cl}^3 + C^2\,H^2\,O^3$	Laurent (acetate of methylen with chlorine.)
Benzoïle	$C^{14}\,H^{10}\,\underline{Cl}^3 + 2\,C^{14}\,H^{10}\,O^3$	Liebig and Whœler (chloride of benzoïle.)
Elayle (†)	$C^2\,H^4\,\underline{Cl} + C^2\,H^4\,O$	F. d' Arcet (chloretheral.)
$C^3\,H^4$	$C^6\,H^3\,\underline{Cl}^2 + C^3\,H^4\,O^2$	Kane (methylic chloral.)
$C^6\,H^3$	$C^6\,H^3\,\underline{Cl}^3 + C^6\,H^3\,O^2$*	Laurent (chlorophénésic acid.)
$C^6\,H^4$	$C^6\,H^4\,\underline{Cl}^2 + C^6\,H^4\,O^2$*	Id. (chlorophénésic acid.)
$C^7\,H^8$	$C^7\,H^8\,\underline{Cl}^2 + C^7\,H^8\,O^5$*	Piria (chloride of salicine.)
$C^{14}\,H^{10}$	$C^{14}\,H^{10}\,\underline{Cl}^5 + 4\,C^{14}\,H^{10}\,O^5$*	Id. (Id.)
$C^{14}\,H^6$	$C^{14}\,H^6\,\underline{Cl}^3 + C^{14}\,H^6\,O^3$ $+ \underline{NH^3}$	Id. (chlorosamide.)

The combinations marked with an asterisk possess the property of uniting with bases without abandoning the chloride combined with them, resembling in this respect the vegeto-sulphuric and vegeto-nitric acids, &c. &c. into the composition of which many different substances may enter. These combinations are five in number: observe then that the chloracetic acid is not a solitary instance of a compound of this kind, and that in order to explain its properties, it is by no means requisite to isolate it from other analogous combinations, and on its account to imagine new views contrary to the general system of chemical knowledge.

The chloric æther of M. Malaguti may be considered in two different points of view. As obtained directly with æther and chlorine, it is very probable that it is composed, as above mentioned, of an atom of acetic acid and of two atoms of chloride of carbon, corresponding to the radical of this acid. But when, for example, benzoate of ethyle is decomposed by chlorine, it appears that the substance produced, and which remains in combination with the benzoic acid, has the formula which I gave in a preceding letter,

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† The name which I have given to the substance $C^2\,H^4$ in the oil of the Dutch chemists, and in the æthereal salts of platina.

$$C^2\,H^6\,O, + 2\,C\underline{Cl}.$$

I will also add some examples of combinations of oxichlorides with other bodies; but they are confined to the oxichlorides of carbon. For the sake of brevity,

E will be $= C^4\,H^{10}$, ethyle;
Me $= C^2\,H^6$, methyle;
F $= C^2\,H^2$, formyle.

$(C\,\underline{Cl}^2 + \ddot{C}) + (S\,\underline{Cl}^2 + \ddot{S})$	A. Marcet and myself (sulphuret of carbon treated with nitro-muriatic acid.)
$(C\,\underline{Cl}^2 + \ddot{C}) + \dot{E}\,\ddot{C}$	Dumas (chloroxicarbonic æther.)
$(C\,\underline{Cl}^2 + \ddot{C}) + \dot{Me}\,\ddot{C}$	Do. (chlorocarbonate of methyle.)
$(C\,\underline{Cl}^2 + \ddot{C}) + F\,\underline{Cl}$	(Chloral.)
$(C\,\underline{Cl}^2 + \ddot{C}) + F^2\,\underline{Cl}$	Kane (methylic chloral.)

In the last the radical may also be considered as $C^4\,H^4$, that is to say, that of the citric, tartaric and succinic acids.

In order then to avoid the revolution which threatens electro-chemical views, it will be seen we have only to place the symbols of the formula of chloracetic acid in an order rather different from that of M. Dumas; and by this slight change the new combination is placed in a class of previously known bodies. An epoch has arrived in which a glimpse of a chemical theory of organic combinations has been perceived; but instead of allowing it to develope as experience extends, it is wished to base it upon isolated facts, viewed without regard to their relations with the system of general knowledge, and on explanations which do not harmonize with the principles of the science; and if, besides, it be concluded that this want of agreement should make us reject as erroneous principles which are otherwise well founded, the truth will never be arrived at.

This is nearly all which I have thought necessary to say upon this occasion for the defence of electro-chemical opinions; but before I conclude, I will add a few words relative to the discussion on the organic metamorphoses produced by heat, a discussion in which MM. Dumas, Peligot, and Payen have given an opinion contradictory to mine.

M. Dumas thinks that I have deceived myself, because he has found an ethylic combination which includes metamorphosed citric acid. The existence of this combination proves neither more nor less than the existence of the other metamorphosed combinations.

M. Payen has shown that the amylate of lead, heated to 266° Fahr. yields no more water when heated to between 266° and 356°, without being partially decomposed. This is precisely what I have myself proved. I did not examine what took place below 266°. With regard to this I referred to the data contained in the memoir published by this skilful chemist upon starch.

M. Peligot, who, I know not why, considers as an attack upon him the explanation which I have given of an observation made by him, and the accuracy of which I have verified, M. Peligot endeavours to prove that I have advanced inaccurate facts. I am persuaded that M. Peligot obtained the results which he quoted in opposition to my views; but I must beg of him to believe as much of mine. The question is then reduced to determining the conditions under which a body metamorphosed by heat is reproduced by the action of water, and those under which it is not. A careful study of organic metamorphoses will, perhaps, discover these conditions. I shall perhaps at some future period return to this subject

Your devoted friend,
JAC. BERZELIUS.
Stockholm, July 15, 1839.

ON THE BORACIC ACID LAGOONS OF TUSCANY.

BY JOHN BOWRING, LL.D.*

The borax regions of Tuscany are entitled to a detailed description. They are unique in Europe, if not in the world; and their produce is become an article of equal importance to Great Britain as an import, and to Tuscany as an export. They are spread over a surface of about thirty miles, and exhibit from the distance columns of vapour, more or less according to the season of the year and state of the weather, which rise in large volumes among the recesses of the mountains.

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* From Dr. Bowring's Report on the Statistics of Tuscany.

As you approach the lagoons, the earth seems to pour out boiling water as if from volcanoes of various sizes, in a variety of soil, but principally of chalk and sand. The heat in the immediate adjacency is intolerable, and you are drenched by the vapour, which impregnates the atmosphere with a strong and somewhat sulphurous smell. The whole scene is one of terrible violence and confusion—the noisy outbreak of the boiling element—the rugged and agitated surface—the volumes of vapour—the impregnated atmosphere—the rush of waters—among bleak and solitary mountains.

The ground, which burns and shakes beneath your feet, is covered with beautiful crystallizations of sulphur and other minerals. Its character beneath the surface at Monte Cerbole is that of a black marl streaked with chalk, giving it, at a short distance, the appearance of variegated marble.

Formerly, the place was regarded by the peasants as the entrance of hell, a superstition derived no doubt from very ancient times, for the principal of the lagoons and the neighbouring volcano still bear the name of Monte Cerboli (*Mons Cerberi*). The peasantry never passed by the spot without terror, counting their beads, and praying for the protection of the Virgin.

The borax lagoons have been brought into their present profitable action within a very few years. Scattered over an extensive district, they are become the property of an active individual, M. Larderel, to whom they are a source of wealth, more valuable perhaps, and certainly less capricious, than any mine of silver that Mexico or Peru possesses. The process of manufacture is simple, and is effected by those instruments which the localities themselves present. The soffioni, or vapours, break forth violently in different parts of the mountain recesses. They only produce boracic acid when they burst with a fierce explosion. In these spots artificial lagoons are formed by the introduction of the mountain streams. The hot vapour keeps the water perpetually in boiling ebullition; and after it has received its impregnation during twenty-four hours at the most elevated lagoon, the contents are allowed to descend to the second lagoon, where a second impregnation takes place, and then to the third, and so forth, till it reaches the lowest receptacle; and having thus passed through from six to eight lagoons, it has gathered one-half per cent. of the boracic acid. It is then transferred to the reservoirs, from whence, after a few hours' rest, it is conveyed to the evaporating pans, where the hot vapour concentrates the strength of the acid by passing under shallow leaden vessels from the boiling fountains above, which is quite at a heat of 80° of Reaümur,* and is discharged at a heat of 60°.† There are from ten to twenty pans, in each of which the concentration becomes greater at every descent till it passes to the crystallizing vessels, from whence it is carried to the drying rooms, where, after two or three hours, it becomes ready to be packed for exportation.

Though to the present proprietor (the Chevalier Larderel ‡) the merit attaches of having given to the boracic lagoons the great importance they now possess, a succession of adventurers had made many experiments, and had produced a considerable quantity of boracic acid, but at a cost (from the expenditure of combustible) which left little profit.§ The small value that was attached to them may be seen in the fact, that the largest and most productive district of the lagoons, that of Monte Cerboli, was offered in perpetuity, so lately as 1818, at an annual ground-rent of 6*l.* 13*s.* 4*d.* per annum, though it now produces several thousand pounds sterling. The immense increase in their value arose from the simplest of improvements, the abandonment of the use of charcoal, and the application of the heat of the lagoons or soffioni to the evaporation of their own waters. Improvements, however, and very important ones, particularly by subjecting the waters to a succession of impregnations, had been gradually introduced by a Signor Ciaschi, and the importation of boracic acid from Tuscany into France, before 1817, had been between 7000 and 8000 pounds, of a quality gradually increasing in purity; but Ciaschi perished miserably, in consequence of falling into one of the lagoons which he himself had excavated, leaving his family in a state of extreme poverty. His death (which happened in

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* The boiling point.

† 167° of Fahrenheit.

‡ While these sheets have been passing through the press, the Grand Duke of Tuscany has conferred on M. Larderel the title of Count de Pomerance.

§ Hoefer first announced the presence of boracic acid in the Maremman districts; and Mascagni in his Commentaries suggests the manufacture of borax as an object worthy of attention. Professor Gazzeri in 1807, made experiments, which, however, seemed to shew that the quantity of boracic acid contained in the waters was too small to promise much success.

1816) naturally threw a damp upon adventure. The experiments were resumed in the following year, and in the midst of violent claims and controversies, M. Larderel has become the monopolist of the boracic productions of Tuscany.

With the increased production of boracic acid has arisen an increased demand, growing out of the more extensive application of it to manufacturing purposes. In about four years, the quantity has been quadrupled by superior modes of extraction, and by greater care employed in the collection of the boracic vapour. In 1833, about 650,000 Tuscan pounds were obtained; in 1836, two millions and a half.

But it appears to me that the powers and riches of these extraordinary districts remain yet to be fully developed. They exhibit a great number of mighty steam-engines, furnished by nature at no cost, and applicable to the production of an infinite variety of objects. In the progress of time, this vast machinery of heat and force will probably become the moving central point of extensive manufacturing establishments. The steam, which has been so ingeniously applied to the concentration and evaporation of the boracic acid, will probably hereafter, instead of wasting itself in the air, be employed to move huge engines, which will be directed to the infinite variety of production which engages the attention of labouring and intelligent artisans; and thus, in the course of time, there can be little doubt, that these lagoons, which were fled from as objects of danger and terror by uninstructed man, will gather round them a large and intelligent population, and become sources of prosperity to innumerable individuals through countless generations.

The number of establishments is nine.* The whole amount produced varies from 7000 to 8000 pounds (of 12 ounces) per day. The produce does not appear susceptible of much extension, as the whole of the water is turned to account; the atmosphere has, however, some influence on the result. In bright and clear weather, whether in winter or summer, the vapours are less dense, but the depositions of boracic acid in the lagoons are greater. Increased vapours indicate unfavourable change of weather, and the lagoons are infallible barometers to the neighbourhood, even at a great distance, serving to regulate the proceedings of the peasantry in their agricultural pursuits.

It had long been supposed that the boracic acid was not to be found in the vapours of the lagoons; and when it is seen how small the proportion of acid must originally be, it will not be wondered at that its presence should have escaped attention. In the lowest of the lagoons, after five, six, and in some cases a greater number of impregnations, the quantity of boracic acid given out does not exceed one-half per cent.; thus, if the produce be estimated at 7500 pounds per day, the quantity of saturated water daily discharged is a million and a half of Tuscan pounds, or five hundred tons English.

The lagoons are ordinarily excavated by the mountaineers of Lombardy, who emigrate into Tuscany during the winter season when their native Apennines are covered with snow. They gain about one Tuscan lira per day. But the works are conducted, when in operation, by natives, all of whom are married, and who occupy houses attached to the evaporating-pans. They wear a common uniform, and their health is generally good.

A great improvement in the cultivation, and a great increase in the value, of the neighbouring soil has naturally followed the introduction of the manufacture of the boracic acid. A rise of wages has accompanied the new demand for labour; much land has been brought into cultivation by new directions given to the streams of smaller rivers. Before the boracic lakes were turned to profitable account, their fetid smell—their frightful appearance, agitating the earth around them by the ceaseless explosions of boiling water, and not less the terrors with which superstition invested them,* made the lagoons themselves to be regarded as public nuisances, and gave to the surrounding country a character which alienated all attempts at improvement.

Nor were the lagoons without real and positive dangers, for the loss of life was certain where man or beast had the misfortune to fall into any of those boiling baths. Cases frequently occurred in which cattle perished; and one chemist, of considerable eminence, met with a horrible death by being precipitated into one of the lagoons. Legs were not unfrequently lost by a false step into the smaller pits (*putizze*), where, before the foot could be withdrawn, the flesh would be separated from the bone.

That these lagoons, now a source of immense revenue, should have remained for ages unproductive; that they should have been so frequently visited by scientific men, to none of whom (for ages at least) did the thought occur, that they contained in them mines of wealth, is a curious phenomenon; nor is it less remarkable, that it was left for a man, whose name and occupation are wholly disassociated from science, to convert these fugitive vapours into substantial wealth.

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* The principal are Monte Cerboli, Monte Rotondo, Susso, Serazzano, and Castelnuovo.

* So unwilling were the peasants to settle in these districts, that very extraordinary encouragements were held out to them.

Many mineral waters are in the neighbourhood of the lagoons, some of which possess medical virtues, and are visited by the Tuscans in the bathing season.

SULPHURETTED HYDROGEN—ACTION ON SOME SALTS OF POTASH.*

BY H. ROSE.

When sulphuretted hydrogen gas is passed into a dilute solution of chromate of potash, acidulated with acetic acid, no sulphuric acid is formed; the same is the case when hydrochloric acid is employed instead of the acetic, provided the solution be so dilute that the acid does not reduce the chromic acid. Sulphur only is separated, but especially in the first case, the separation requires some hours. If, however, the solution be heated, then a notable quantity of sulphuric acid is formed, sulphur being also always separated, but in small quantity.

A solution of iodate of potash, or of soda even, when cold, is decomposed by sulphuretted hydrogen, and a great quantity of sulphuric acid is formed. It then becomes of a reddish brown colour, on account of the iodine set free, but the ulterior action of the sulphuretted hydrogen decolorates it. The deposit of sulphur, which occurs in this case, is caused by the conversion of the iodine set free into hydriodic acid. The solution reddens litmus paper sensibly after decomposition, and contains sulphuric and hydriodic, but no iodic acid. After the destruction of the sulphuretted hydrogen by a solution of oxide of copper, nitrate of silver produces in the liquor separated from the sulphuret of copper, a precipitate insoluble in ammonia. It is well known that a mixture of free iodine and water is converted by sulphuretted hydrogen into hydriodic acid, accompanied with a deposit of sulphur, and without forming any sulphuric acid. If, however, the mixture be heated during the action of the sulphuretted hydrogen, sulphuric acid is formed in small quantity. A solution of bromate of potash acts with sulphuretted hydrogen like that of iodate of potash. In the cold solution there are produced sulphuric and hydrobromic acids and a deposit of sulphur.

Chlorate of potash, on the contrary, is not decomposed by sulphuretted hydrogen, either cold or even at a boiling heat. Neither sulphuric nor hydrochloric acid is formed, and the liquor does not lose its neutrality. If it assume an opalescent appearance, on account of a trace of sulphur which is separated, it is derived merely from the decomposition of some sulphuretted hydrogen by the air of the atmosphere. If the sulphuretted hydrogen contained in the solution be destroyed by oxide of copper, a salt of silver added to the solution after the separation of the sulphuret of copper, produces no precipitate of chloride of silver. The solution of oxichlorate of potash acts exactly the same as that of the chlorate, with sulphuretted hydrogen.

FALL OF A METEORITE IN MISSOURI, FEBRUARY 13, 1839.*

On the afternoon of the 13th of February, 1839, a meteor exploded near the settlement of Little Piney, Missouri, (lat. 37° 55′ N.; lon. 92° 5′ W.) and cast down to the earth one stony mass or more in that vicinity. Mr. F. Shepherd, of this city, who was at the time exploring this region, hearing of the explosion of the meteor, exerted himself to collect all the circumstances of the occurrence. He subsequently succeeded in obtaining several fragments of one of the stones thrown down by the meteor, and has favoured me with an opportunity to examine these fragments, and has also communicated to me the details below related.

At Little Piney, Mr. Harrison and others saw the meteor burst in pieces, and in a minute or a minute and a half afterwards, they heard three explosions in quick succession. Some of the inhabitants went in quest of the stones which they supposed had fallen, and finally found a tree which appeared to have been recently injured by the collision of some solid body. Near this tree they discovered (although the ground was covered with three or four inches of snow,) one of the meteoric stones, about as large as a man's head, partly imbedded in the earth; and from the circumstances of its position and appearance, there could be no reasonable doubt that this was the body which had struck the tree.

The total weight of the fragments which Mr. S. has brought home, is 973 grains. The specific gravity of one of the small fragments is 3·5; but different portions of the stone may vary slightly in this respect, as they may contain more or less of the metallic matter. The resemblance between this meteorite and those of Tennessee, (Silliman's Journal, xvii. 326.) of Georgia, (Ib. xviii. 389,) and of Weston, Conn., is very close, and one might almost imagine that they were all parts of the same original mass. The cohesion of the stone is not great, as it crumbles under a moderate blow. Two of the fragments retain portions of the crust or exterior coating. This is a fifteenth of an inch thick, and bears evidence of intense ignition and partial fusion. It is black, with a wrinkled or cellular surface, and is traversed with seams. The general colour of the interior is an ash-gray. The whole mass is studded with metallic particles, (varying from the size of small shot down to mere points), and presents numerous rusty spots, and occasional small spheroidal concretions which do not appear to differ in materials from other parts of the stone. The little metallic masses (doubtless of nickeliferous iron) are attracted by the magnet, and are generally permeated by the earthy matter. They are mostly of an iron-white colour, but several are yellow and slightly iridescent. One of these minute masses being removed from the stone, it was by the hammer at once extended into a thin lamina, and was evidently malleable.

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* *Journal de Pharmacie*, Août, 1839.

* *Silliman's Journal*, vol. xxxvii. p. 385.

E. C. Herrick.

Sept. 25, 1839.

CHLOROSULPHURET OF MERCURY.*

M. Capitaine prepares this compound (which he calls a chlorohyposulphite of mercury) by mixing accurately ninety-four parts of bichloride of mercury and six parts of sulphur. The mixture is to be put into a platina capsule, covered with a funnel, and very moderately heated; an efflorescence rises from all the points of the surface and a thick crust is formed; the capsule is to be taken occasionally from the fire to remove the crystals formed, and is to be again heated to procure more of them. This compound may be obtained directly by making a mixture of protochloride of mercury and chloride of sulphur in sufficient quantities to form a thin paste. After twenty-four hours' digestion in a close vessel, it is to be gently heated; the excess of chloride of sulphur is dissipated; the matter fuses, becomes red, and sublimes; this compound may also be formed by the action of sulphuret of arsenic upon bichloride of mercury.

Chlorosulphuret of mercury is of a yellowish white colour; the crystals are exactly similar in form to those of bichloride of mercury; when exposed to the action of heat, they fuse into a brown liquid, capable of boiling and volatilization without undergoing any change. This compound is immediately decomposed by water, which converts it into bichloride of mercury, and sulphur, which precipitates in the state of a granular powder. This ready decomposition effected by water, renders the analysis very easy; for it is sufficient to take a known weight of it, to boil it for some time in water, and to determine the quantity of sulphur deposited, which being subtracted from the weight employed, the difference is bichloride of mercury. Having, however, found this method not to be quite free from objection, the relative proportions of the elements were determined by direct means. The mercury was reduced to the metallic state, the sulphur was obtained uncombined, or as sulphate of barytes, and the chlorine in combination with silver.

A known weight of the compound was passed in vapour over iron filings heated to redness. The mercury was condensed at the end of the tube, and 100 parts yielded 69 of it; in another experiment, in which the mercury was converted into sulphuret, the same result was obtained.

In order to determine the sulphur, 100 parts were heated to redness with soda and nitre. The product of the operation dissolved in water; the liquor supersaturated with nitric acid, and precipitated by nitrate of barytes, gave 41 of sulphate of barytes = 5·65 of sulphur: by boiling 100 parts in water, so as to effect complete decomposition, 5·70 parts of sulphur were obtained; agreeing very nearly with the above experiment.

In order to determine the chlorine, 100 parts of the substance were dissolved in water; the filtered liquid was treated with sulphuretted hydrogen to precipitate the mercury, and then the excess of this gas being expelled by heat, the chlorine was precipitated by nitrate of silver; the chlorine indicated by this amounted to 24·67.

This salt therefore consists of

Mercury	69	
Chlorine	24·67	
Sulphur	5·65	—99·32

or very nearly

One equivalent of mercury ..	202	or	69·67
Two ,, chlorine ..	72		24·82
One ,, sulphur ..	16		5·51
	290		100·

It may therefore be regarded as composed of

One equivalent of chloride of mercury = 238
One ,, chloride of sulphur = 52
290

A proof of the probability of this view of its nature is the fact already stated, that it may be prepared by the direct action of these compounds on each other.

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* *Journal de Pharmacie*, Sept. 1839.

CHLORIODIDE OF POTASSIUM.*

BY M. FILHOL.

When a current of chlorine gas is passed through perfectly neutral iodide of potassium dissolved in twice its weight of water, the first bubbles of the gas communicate a brown colour to the liquor; the intensity of this colour increases; the liquor soon becomes opaque, and iodine is precipitated in a pulverulent state. If the operation be stopped when this deposit ceases to be formed, all the iodine is separated, no sensible quantity of chloride of iodine is formed, and the liquor contains chloride of potassium; if the operation be continued, the iodine redissolves, and the liquor assumes a fine golden colour. Sometimes a little chloriodate of potash precipitates; this happens especially if the iodine is not perfectly neutral, and it is easy to account for it. When all the iodine is dissolved, it is proper to continue the disengagement of the chlorine: fine golden coloured needles soon appear in the liquor, and the quantity increases as the saturation with the chlorine proceeds. When a saturated solution of the iodide is employed, the liquor submitted to the action of the chlorine, is eventually converted into a yellow needle-formed mass of a beautiful appearance; in order that the re-action may be perfect, it is well to heat the liquor slightly, that the tube which conveys the chlorine may not be obstructed.

When the chlorine ceases to be sensibly absorbed, the operation is to be stopped, and then, in order to obtain finer crystals, the bottle may be immersed in water heated from 105° to 125° Fahr.; by this the crystals are redissolved, and recrystallization takes place slowly. The crystals are similar to those obtained by the action of hydrochloric acid on iodate of potash; but the process now described is very convenient for obtaining considerable quantities of this salt.

It appears to be composed of
One equivalent of bichloride of iodine..................234
One equivalent of chloride of potassium .... 76—310
and when it is heated the perchloride of iodine is expelled and the chloride of potassium remains.

The iodides of ammonium and of magnesium furnished results corresponding to the above; but the iodides of sodium and barium did not yield chlorosalts. Biniodide of mercury was treated in the same manner, and a fine golden-coloured solution was obtained which did not yield crystals.

It will be observed that chlorine acts upon the iodides as it does upon the sulphurets; but the chloride of sulphur combines readily with acid chlorides, whilst the chloride of iodine combines better with the alkaline chlorides.

It ought to be observed, that the salt obtained by the process above described, if it be required very pure, ought to be very quickly separated from the watery liquid, in which it was formed; for if the chloride of iodine is decomposed in iodic and hydrochloric acids, which may happen, as is well known with great readiness, it may occur that the less solubility of the iodate of potash may determine the decomposition of the alkaline chloride, and the precipitation of a little iodate, for there does exist sufficient hydrochloric acid to prevent the formation of the iodate which occurs rapidly; the salt therefore intended for analysis ought to be separated as soon as it is formed.

The addition of hydrochloric acid is even indispensable to prevent also the precipitation of the salt discovered by Serullas, the crystals of which are readily distinguished by the unassisted eye.

ON A NEW CHEMICAL COMBINATION OF ARSENIC, MERCURY, AND IODINE; AND ON ITS MEDICINAL EMPLOYMENT.*

BY MR. DONOVAN.

Triturate 6·08 grains of finely levigated metallic arsenic, 15·38 grains of mercury, and 50 grains of iodine, with one drachm measure of alcohol, until the mass has become dry, and from being deep brown has become pale-red. Pour on eight ounces of distilled water; and after trituration for a a few moments, transfer the whole to a flask; add half a drachm of hydriodic acid, prepared by the acidification of two grains of iodine, and boil for a few moments. When the solution is cold, if there be any deficiency of the original eight ounces, make it up exactly to that measure with distilled water. Finally filter.

The theory of this process need scarcely be adverted to. By the long-continued trituration of arsenic, mercury, iodine, and alcohol, the metals are converted into iodides, which combine. The mass by solution in water is converted into an hydriodate of arsenic and mercury. The quantities of the two metals are so adjusted, that when converted into protoxides by decomposition of a portion of the water in which they are dissolved, there will be eight grains of protoxide of arsenic, and sixteen of protoxide of mercury. The quantity of water is such that each drachm measure of the solution will contain exactly one-eighth of a grain of protoxide of arsenic, and one-fourth of a grain of protoxide of mercury. I conceive that the quantity of mercury ought to be double that of the arsenic, in order to insure a slow and moderate, yet adequate mercurial action, along with the proper effect of the arsenic.

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* *Journal de Pharmacie*, Août, 1839.

* *Dub. Journ. Nov.* 1839.

Of this *liquor hydriodatis arsenici et hydrargyri*, each drachm measure consists of—

Water, one drachm.
Protoxide of arsenic, one-eighth of a grain.
Protoxide of mercury, one-fourth of a grain.
Iodine, (converted into hydriodic acid,) four-fifths of a grain.

The colour of the solution is yellow, with a pale tinge of green: its taste is slightly styptic. It cannot be properly conjoined with tincture of opium, or with sulphate, muriate or acetate of morphia; for all these produce immediate and copious precipitates in it. Hence if opiates are to be used during the exhibition of this arsenico-mercurial liquor, they must be taken at different periods of the day. Tincture of ginger produces no bad effect. The following formula is proper:—

℞. Liquoris Hydriodatis Arsenici et Hydrargyri drachmas duas.
Aquæ Distillatæ uncios tres cum semisse.
Syrupi Zinziberis semunciam. Misce.
Divide in haustus quatuor. Sumatur unus mane nocteque.

Thus one-sixteenth of a grain of protoxide of arsenic, and one-fourth of a grain of protoxide of mercury, would be taken in each dose, along with two-fifths of a grain of iodine, which being in the state of combined hydriodic acid, will be much diminished in energy of medical effect. This is no doubt the proper dose to begin the exhibition of arsenic with; but it will be very soon necessary to increase it.

The division into draughts is here necessary: first, to insure accuracy of the dose, so essential in the case of this active medicine: and next, to prevent injury to the ingredients by the use of a metallic spoon as a measure—the general way in which, unfortunately, the dose of a medicine is determined.

Mr. Donovan recommends this in cases in which its ingredients have been found serviceable.

ON VEGETABLE TISSUES AND ON MANURES.

BY M. PAYEN.

In two separate memoirs, but connected in certain respects, M. Payen has shown that the elementary composition of vegetable tissues, freed from every foreign substance, was the same, to whatever order the vegetable might belong, from the most complicated phanerogamia to the simplest cryptogamia. That this composition is isomeric with that of certain vegetable products; starch, dextrine, normal and fluid inulin. Other resemblances exist between starch and vegetable membranes. Thus the amylaceous substance forms an integrant of the cortical part of the lichen of Iceland, which does not afford any starch in the seeds.

This elementary composition of vegetable membranes, which is ternary, and susceptible of undergoing a certain chemical action, such as its transformation into isomeric dextrine and sweet glurose, presents, according to M. Payen, a sure means of distinguishing the membranes of vegetable from animal tissues. Azote is also exhibited in vegetables, but it makes part of the organic bodies in solution in the liquids in the midst of which are formed the vegetable membranes, and which seem indispensable to their development, by a simple effect of contact, since they are not fixed in them; whence the considerable proportion of azote contained in all nascent vegetation.

Whence also the necessity of azotous manure in agriculture. M. Payen proves that manures, even vegetable, are only valuable in proportion to the quantity of azote they contain, and that if certain vegetable detritus, such as exhausted turfs and soils, become unfit for agriculture, it is because they have lost the azote which they contained. Indeed, he established on this subject a practical certainty, by showing a scale of the pecuniary value of the different manures in use, that their value is so much higher, as they contain a greater proportion of azotous matter.

ON THE EXISTENCE OF IODINE IN THE PRODUCTS OF THE COMBUSTION OF COAL-PITS.

BY M. BUSSY.

M. Bussy called to mind the small number of natural products in which iodine has hitherto been met with. Besides certain vegetables and salt springs, it has been found only once by Vauquelin in an ore of silver, and by M. Delrio in an ore of silver and lead. The existence of iodine in the products of coal mines is, therefore, an interesting fact.

At Commentry, pit-coal is worked in the open air; heaps of the pyrites which it contains become heated and take fire spontaneously; they disengage vapours charged with sulphurous and hydrochloric acids, which allow white or reddish yellow efflorescence to be deposited upon the opening of the mine; they contain sal ammoniac, and are coloured by sulphur and sulphuret of arsenic. M. Bussy has since recognized in it hydriodate of ammonia.

He thinks that this salt might also be found in the products of other coal mines; but as it is very rapidly decomposed, it could only be proved by experiments made upon the spot.

ON THE COMPOSITION OF MILK.*

BY M. DONNE.

M. Donné considers milk as consisting of a fluid holding in solution caseum, a particular variety of sugar and salts, and in a state of suspension globules of fatty matter or butter. Alcohol and ether dissolve the fatty or milky globules, but have no action on the caseum. A watery solution of iodine colours the caseum yellow, but has no action on the milky globules. These facts prove that the caseum forms no part of the milky globules, and does not exist in a concrete form in the milk.

All the milky globules are retained by the filter, and the liquid which passes through it is as transparent as water, and on the addition of an acid deposits the caseum. This fact proves that the caseum is in a state of solution, and also that the white colour of the milk is owing to the presence of the milky or fatty globules which are suspended in it. Milk may, therefore, be considered as an emulsion.

When milk is allowed to stand, the cream ascends to the surface. The caseum is only the separation of the milky globules on account of their lighter specific gravity; and if the milk be examined in a transparent vessel, it will be seen that the layer next the cream is the whitest, whilst that at the bottom of the vessel is of a greenish hue, and semitransparent. This difference of hue is owing to the greater or lesser proportion of milky globules in the different parts of the fluid.

When it is allowed to stand some time longer it becomes acid, though it was alkaline when first drawn. The cream gradually thickens, the caseum becomes consolidated, gaseous matters are disengaged, a strong odour of rotten cheese is perceived, and the microscope discovers a multitude of animalcules and infusory vegetables. If the milky globules be previously separated, they are found to become rapidly acid; whilst the watery portion holding in solution the caseum undergo the alkaline or putrefactive decomposition.

The infusory vegetables in milk are not observable till long after it has undergone the acid change. It cannot, therefore, be considered as the cause of the acetous fermentation, as is remarked in vegetable infusions, which undergo the alcoholic fermentation. The infusory animalcules exist equally in the acid as in the alkaline part of the milk during these changes.

M. Donné has remarked that there is a fixed relation between the secretion of the colostrum in the breast before delivery, and the secretion of the milk after that process; and he thinks that women may be in this respect divided into three classes. The *first* class includes those in whom there is scarcely any milky secretion till delivery is over. In them the colostrum consists of a viscous liquid containing a very few milky globules mixed with granular bodies. In these circumstances the milk after delivery is always poor, and in small quantity. In the *second* class the colostrum is more or less abundant, but is poor in milky globules, which are small and ill-formed. Besides the granular bodies, mucous globules are detected in the colostrum. After delivery, the milk is more or less abundant, but is poor and serous. In the *third* class, the colostrum is rich in regularly-formed milky globules, and is only mixed with the usual granular bodies. The milk which is secreted after delivery is abundant, rich, and of good quality. It is this class of women who ought always to be preferred as nurses.

ON THE SUPPOSED EXISTENCE OF FLUORIC ACID IN ANIMAL MATTER.*

BY G. O. REES, M.D., F.G.S.

Baron Berzelius has published a paper in the 61st vol. of the "*Annales de Chimie;*" in which he states, fluoric acid may be detected in human teeth, bones, and urine; and may be demonstrated, in the latter case, by operating on the precipitate obtained from the excretion by means of lime-water. Since the publication of this paper by Berzelius, the existence of fluoric acid, as a constituent of the animal substances above mentioned has been acknowledged by chemists generally; and it is mentioned as such in the standard chemical works of the present day.

Having lately been engaged in the analysis of human bone, with more especial reference to those ingredients which have been stated to exist in small proportion, I was led to search particularly for fluoride of calcium. My experiments were made in the usual manner, by trying to obtain the corroding action of fluoric acid on a plate of glass, which was used as a loose cover to a platinum crucible, which contained the substance for examination, mixed with strong sulphuric acid. A gentle heat was applied to the bottom of the containing vessel. In this way, several specimens of human bone (both before and after calcination) were subjected to experiment; but in no instance could I obtain any action upon the glass.

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* *Compte Rendu de l'Academie des Sciences*, Sept. 16, 1839.

* *Guy's Hospital Reports*, Aug. 1839.

The experiment which the Baron recommends, in order to obtain corrosion from bone-earth, is, to distil equal parts of strong sulphuric acid, and water upon it, until the measure of water is brought over. He states, that the distilled liquor, if evaporated in the glass receiver, will produce a corrosion. I repeated this experiment, using 100 grains of bone-ash, and an ounce of the acid mixture; but could obtain no action on the receiver, by evaporating the distilled liquor; nor was there any corrosion or opacity produced on any part of the apparatus.

During the evaporation of the last portions of the liquor, dense white fumes appeared; and there was some difficulty in vaporizing the whole of it. On neutralizing a portion with ammonia, and testing it with nitrate of silver, a yellow precipitate of phosphate of silver was thrown down. A further examination showed the presence of sulphuric acid, and traces of hydrochloric acid. I was much surprised to find phosphoric acid in this result of aqueous distillation, as the heat had not been urged during the process; for I had considered that acid as of too fixed a nature to volatilize with water at so low a temperature. It appeared to me now, that the presence of phosphoric acid, in this distilled liquor, might be a source of fallacy in the above experiment for establishing the presence of fluoric acid as a constituent of human bone; for it is a well-known fact, that phosphoric acid, if heated on glass of inferior quality till it volatilize, will act upon it with considerable energy;* and all the animal substances in which fluorine has been said to exist, are particularly rich in phosphoric acid;—thus the ashes of ivory, of human bone, and the enamel of teeth, as also the precipitate obtained from urine by means of lime water, are all of them composed, in very great part, of phosphate of lime. Mr. Richard Phillips has mentioned (in the Annals of Philosophy, vol. v.) that when the water contained in uranite is driven off from the powdered mineral, a portion of the phosphoric acid is volatilized with it; the heat used being that of a common spirit-lamp. This is the only fact with which I am acquainted (with the exception of my own observation), to show that phosphoric acid will volatilize with water. The heat used in Mr. Phillips's experiment was, most probably, considerably higher than any which I applied. There seems no doubt that phosphoric acid is much more volatile than it has heretofore been supposed.

Having failed in detecting fluoric acid in human bones, I determined on testing for its presence in the enamel of teeth, in recent ivory, and in the precipitate obtained from urine by the addition of lime-water. Two different specimens of ivory (tusks of the elephant) gave no evidence of the presence of fluoric acid, when carefully tested, either before or after calcination; and I was equally unsuccessful with the enamel of human teeth and the precipitate from the urine.†

In these experiments, when I had failed in acting on the glass, I always found that the addition of 0·3 grains of fluoride of calcium to the experiment produced a strong and indelible mark on the surface of the glass test-plate. I mention 0·3 grains, because it will always be found sufficient to produce a most unequivocal corrosion; though I obtained satisfactory results by the addition of a much less quantity. I have had only one opportunity of examining fossil ivory; and in that instance I could not astertain its locality: on submitting it, however, to the tests used for recent ivory, bone, &c., I obtained immediate action on the glass.

In conclusion, I must express my firm conviction, that fluoride of calcium, as an ingredient in fossil ivory, must be regarded as an extraneous matter, introduced by the partial mineralization of the animal substance; — that no such constituent exists in recent ivory, the enamel of teeth, human bone, or urine;— in fact, that fluoride of calcium should be expunged from the list of the constituents of animal substances.

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* It must be borne in mind, that the fluoric acid acts with facility on every kind of crown or flint glass, however good their quality may be. The supposition that bad glass was used in the experiment is the only means I have of explaining away that which I feel sure is an error on the part of several continental chemists.

† I was much pleased to observe, that Mr. Pepys, in an analysis of enamel published in Mr. Fox's work on the Teeth, does not mention fluoride of calcium as an ingredient of that substance. This analysis was made by Mr. Pepys in 1833, several years after the fluoride had been declared a constituent of the enamel.

WHITENESS OF PRECIPITATED SULPHUR.*

BY M. H. ROSE.

It is a well-known fact, that sulphur, which separates from liquids in a state of minute division, has not the usual yellow colour of sulphur, but is whitish or grayish. The cause of this difference of colour has been long a subject of discussion, and it has been generally concluded that it arises from the different states of division. If milk of sulphur and flowers of sulphur be examined by the microscope, the grains of the milk of sulphur are certainly observed to be the smaller of the two; but this is unquestionably not the only cause of the difference between them.

In the opinion of M. Rose it has escaped notice, that the peculiar yellow colour of sulphur is wanting only in those cases in which it is deposited from solutions containing free sulphuretted hydrogen; the more they contain of this the whiter is the sulphur. It is never whiter than when it is deposited from water saturated with sulphuretted hydrogen, in which the hydrogen of the sulphuretted hydrogen has been gradually oxidized by the contact of the air. If on the contrary finely divided sulphur be precipitated from solutions which do not contain free sulphuretted hydrogen, it has a yellow colour, even when the quantity is small. It is sufficient to decompose a small quantity of a solution of an alkaline hyposulphite by an acid, to be convinced of the truth of this assertion.

White or gray precipitated sulphur, (milk of sulphur,) contains a very small quanity of sulphuretted hydrogen, in the state of persulphuret of hydrogen. If it be fused, and the small quantity of gas disengaged from the surface of the fused sulphur be conducted by the aid of a current of atmospheric air into a solution of lead, a notable quantity of sulphuret of lead is obtained. M. Rose treated in this way a large quantity of the different modifications of this white sulphur prepared in different modes, and he always obtained the same results.

In melting flowers of sulphur, or roll sulphur, it is true that there is sometimes obtained a little sulphuretted hydrogen; but the quantity of it is so small that it cannot be compared with that disengaged from the milk of sulphur. Water cannot remove from this last-mentioned substance the small quantity of sulphuretted hydrogen which it contains; for all the modifications examined were washed with water till it produced no effect in solution of lead.

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* *Journal de Pharmacie*, Août, 1839.

FORMATION OF SULPHURIC ACID.*

BY M. H. ROSE.

It is well known that sulphuretted hydrogen gas reduces the higher oxides of some metals to a lower state of oxidation. It is generally admitted that this reduction is derived from the formation of water; and the simultaneous separation of sulphur seems to authorise this opinion. A considerable time since, I observed that in some of these cases sulphuric acid was produced, but which could not be detected in others. This fact gave rise to the following experiments:—

Sulphuretted hydrogen gas does not produce sulphuric acid in a cold solution of sesquioxide of iron. If this oxide, recently precipitated, be dissolved in acetic acid, and a great excess of acetic acid be added to the solution, in order to avoid, as much as possible, the production of sulphuret of iron by the current of sulphuretted hydrogen, no sulphuric acid is found in the solution; nor is there any formed if the solution be heated during the introduction of the gas.

If sulphuretted hydrogen gas be passed into a neutral solution of chloride of iron, or acidified by hydrochloric acid, sulphur only is separated, without the production of sulphuric acid. If, however, the solution be heated while the gas is passing into it, sulphuric acid is formed in the solution, the production of which, under these circumstances, seems worthy of observation. It also takes place when a solution is used, which is prepared by treating iron with hydrochloric acid and adding nitric acid, and in employing a pure solution of chloride of iron, and which contains no free chlorine, prepared by heating pure iron in chlorine gas. These solutions had hydrochloric acid added to them, in order to prevent the separation of sesquioxide of iron by ebullition. The formation of sulphuric acid cannot therefore be attributed, in these circumstances, to the admixture of a small quantity of nitric acid. When sulphuretted hydrogen is employed to determine the proportion of sesquioxide of iron contained in a mixed solution of sesquioxide and protoxide, by the quantity of sulphur precipitated, the solution must be used cold.

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* *Journal de Pharmacie*, Août, 1839.

II. CHEMICAL MANUFACTURES.

PURIFICATION OF COPPER.*

BY MR. LEWIS THOMPSON.

The art of manufacturing copper appears to have been known from the most remote antiquity; indeed, judging from the purity of the coins and warlike instruments which have descended to us, we might at first suppose that this, like some other of the arts formerly in use, had been partially lost, and that the ancients were better acquainted with the mode of making pure copper than we are at the present day. The great purity of their cupreous alloys is, however, much better accounted for, by attributing it to the richness of the ores then in use: for, in all probability, they were unable to extract copper from such poor pyritic ore as is now employed for that purpose, and from which English commercial copper is obtained, in a state of sufficient purity for the ordinary purposes to which copper is applied. It is always, however, contaminated with the foreign matters existing in the ore: these are chiefly iron, lead, arsenic, sulphur, and antimony: carbon, too, is occasionally imparted during the process of reduction. These impurities vary from two to seven per cent., and greatly impair the ductility and malleability of the metal. With one-half per cent. of arsenic, sulphur, or antimony, copper is decidedly brittle under the hammer, and with one per cent. this effect becomes very obvious. Lead and iron have a less injurious effect; but in the proportion of two per cent., they materially affect the colour and texture, and the alloy has a harsh, dull, and mottled appearance when polished. With a very small quantity of carbon, copper is brittle, and has a gray, uneven fracture.

The Swedish copper being almost free from these impurities has long been held in high estimation, not only in this country, but also on the Continent, where the finer kinds of brass are made almost solely with it, to the exclusion of the English copper; a cheap and effectual mode of removing the impurities from which has long been a desideratum. The following method will be found to answer that purpose, and its simplicity is such as to require no particular care or management on the part of the workmen:—

Take of impure copper..	100 parts;
Copper scales	10 parts;
Ground bottle glass, or any other flux.	10 parts;

heat the whole together in a covered crucible, and keep the copper in a state of fusion for twenty minutes or half an hour, at the end of which time it will be found at the bottom of the crucible perfectly pure. The quantity of copper scales must vary in proportion to the supposed impurity of the copper to be operated on; but the proportions here given will be found to answer very well for the average kind of English copper. The explanation of this process is sufficiently simple: the impurities contained in the copper, consisting, as we have seen, of iron, lead, arsenic, &c., combine with the oxygen, contained in the copper scales, and form oxides or acids, which are dissolved by the flux, or fly off in a gaseous form, leaving the purified copper, together with that reduced from the scales, at the bottom of the crucible; consequently, the copper obtained exceeds that put into the crucible, the gain generally averaging from one to one and a half per cent. In this way I have obtained perfectly pure copper from brass, bell-metal, gun-metal, and several other alloys containing from four up to fifty per cent. of iron, lead, antimony, tin, bismuth, arsenic, &c.

In my earlier experiments, I made use of the oxide of copper obtained from the acetate or sulphate, and proposed in practice to employ some of the native oxides of sufficient purity, such as the malachites. Mr. Aiken, however, has since kindly pointed out to me the scales of copper, as the cheapest and most abundant source for obtaining the oxide, since they are produced in large quantities at every copper manufactory. I have repeated nearly the whole of my experiments with them without observing any variation in the result, as might, indeed, have been anticipated.

ON THE INTRODUCTION OF PLASTER IN THE MANUFACTURE OF PAPER, AND MEANS OF DETECTING THIS ADULTERATION.

BY M. WISLIN.

M. Wislin has detected the presence of plaster in the proportion of fifteen to twenty-five per cent. in the paste of several samples of paper intended to be sold by weight. This very prejudicial fraud to the interests of the purchaser, presents again serious inconveniences as to certain uses for which the paper is destined, particularly for lithography. M. Wislin has found that papers of this nature destroyed in a very short time the lithographic designs of which it was desired to reproduce the proofs.

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* From the *Transactions of the Society of Arts, &c.*

M. Wislin analysed the paper by torrefying it gently to destroy the size, boiling it with the carbonate of potassa to transform the plaster into sulphate of potassa, with the solution of which he poured a salt of baryta, which showed the quantity of sulphate of lime sought by that of the sulphate of baryta formed; but he points out a means more within common reach to detect the presence of plaster; it is to calcine the paper in a close vessel, and to dilute the residue with vinegar, in a silver spoon: if sulphuretted hydrogen is disengaged, which blackens the spoon, the presence of a sulphate in the paper will be shown.

EMPLOYMENT OF THE ELECTRICAL PROPERTIES OF BODIES FOR THE DETECTION OF THE ADULTERATIONS OF WHICH THEY ARE THE SUBJECT.

BY M. ROUSSEAU.

M. Rousseau, the inventor of the diagometer which bears his name, and by the aid of which the purity of olive oil is tested, announces that he has applied it to the examination of chocolate and coffee. Thus pure chocolate is entirely insulating, but the addition of fecula gives it conducting power. Coffee, on the contrary, is a good conductor, and the presence of chicory has the effect of diminishing, and even of extinguishing this property.

ON THE DISADVANTAGE OF USING BLACK PAINT ON BOARD SHIP.*

BY MR. LEWIS THOMPSON.

There is nothing that will prove this evil more than by observing the black streaks of a ship after being in a tropical climate for any length of time. It will be found that the wood round the fastenings is in a state of decay, while the white work is as sound as ever: the planks that are painted black will be found split in all directions, while the frequent necessity of caulking a ship in that situation likewise adds to the common destruction; and I am fully persuaded, that a piece of wood painted white will be preserved from perishing as long again, if exposed to the weather, as a similar piece painted black, especially in a tropical climate.

I have heard many men of considerable experience say, that black is good for nothing on wood, as it possesses no *body* to exclude the weather. This is indeed partly the case; but a far greater evil than this attends the use of black paint, which ought entirely to exclude its use on any work out of doors, viz. its property of absorbing heat. A black unpolished surface is the greatest absorber and radiator of heat known; while a white surface, on the other hand, is a bad absorber and radiator of the same: consequently black paint is more pernicious to the wood than white. This may, and has been proved, by innumerable experiments; but the following simple experiment may perhaps be considered worthy of notice:—Take four pieces of tin plate and place them together in pairs, having the inner surface smeared with lard so that they may adhere together; then colour one pair black, leaving the other white, and suspend them equidistant from a small iron ball made red hot: it will be found that the black surface presented to the ball absorbs the heat, and soon gets charged sufficiently to melt the lard, and the result is that the two plates immediately separate; on the other hand, the white remains firm, as the rays from the heated body are for the most part reflected by the white surface.

The foregoing experiment plainly shews, that the wood having a black surface will imbibe considerably more heat in the same temperature of climate, than if that surface was white; from which circumstance we may easily conclude, that the pores of wood of any nature will have a tendency to expand, and rend in all directions, when exposed under such circumstances,—the water of course being admitted, causes a gradual and progressive decay, which must be imperceptibly increasing from every change of weather. The remedy to so great an evil is particularly simple; viz., by using white, instead of black paint, which not only forms a better surface, but it is a preventive to the action of heat, and is more impervious to moisture. The saving of expense would also be immense, and I am convinced that men of practical experience will bear me out in my assertion.

Two striking circumstances, which have fallen under my own immediate notice, deserve mention. The first was the state of H. M. Sloop Ringdove, condemned by survey at Halifax, N. S. in the year 1828.

This brig had been on the west India station for many years. On her being found defective, and a survey called, the report was to the effect that the wood round all the fastenings was totally decayed in the wake of the black, while that in the wake of the white was as sound as ever; a striking proof of the different effect of the two colours.

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* From the *Transactions of the Society of Arts, &c.*

The next instance I shall mention relates to H. M. Ship Excellent, of 98 guns, (formerly the Boyne.)

This ship is moored east and west, by bow and stern moorings; consequently, the starboard side is always exposed to the effects of the sun, both in summer and winter. In this situation her sides were painted in the usual manner of a ship of war; viz. black and white, of which by far the greater part is black; this latter portion on the starboard side I found it impossible to keep tight; for, as often as one leak was apparently stopped, another broke out, and thus baffled the skill of all interested. In the meantime, the side not exposed to the rays of the sun remained perfectly sound. I then suggested to Mr. Kennaway (the master-caulker of her majesty's dockyard at Portsmouth), who had previously given the subject consideration, the advantage likely to be derived from altering the colour of the ship's side from black to white. Captain Hastings having approved of the alteration, the ship was painted a light drab colour where it was black before, upon which the leaks ceased, and she has now continued perfectly tight for more than twelve months; and, indeed, I can confidently state, that the ship will last as long again in her present situation, as she had begun to shrink and split to an astonishing extent when the outside surface was black, which has entirely ceased since the colour was altered.

Instances of the injurious effects of black paint on shipping generally, also on the masts, yards, boats, &c., are of daily occurrence, and decidedly point out the benefit likely to result from the substitution of the one colour for the other, and manifest advantage to be derived from its use by the maritime interest, though I am aware some may object to its use as not being shipshape. To such I have only to state, that the application of copper to ship's bottoms, and the use of chain for cables, met with the same foolish objection at the time of their introduction, since which period thousands of valuable lives, with property to a large amount, have been saved by their instrumentality.

PRESERVATION OF BODIES.

In our First Number we quoted from the Medical Gazette a communication on this subject to the Editor of that Journal. We now abridge, from the same Journal, some further remarks by Dr. Babington.—In a letter to the Editor, Dr. Babington says:—

Dr. Marshall, of Glasgow, takes occasion to condemn the means recently recommended for this purpose by Dr. Rees and myself.

I shall therefore review both his process and ours, under the three following heads,—comparative expense; comparative trouble; comparative efficacy.

1. Comparative expense.—We must certainly yield to Dr. Marshall in this particular. One of his subjects cost in preparation five shillings, the other little more than two, while ours cost twelve shillings. It is usual at our hospital for eight gentlemen to engage in the dissection of one body. The expense of bearing that portion allotted to each, efficiently preserved, is eighteenpence, and when we take into consideration that the work of the students' hands may be studied for two months, instead of being allowed, in one quarter of that time, to "thaw and resolve itself into a dew," by putrefaction, we think that he will in reality be a great gainer, even in pocket, by the difference.

2. Comparative trouble:—Our method, be it remembered, consists in injecting the subject by the aorta with pyroxylic spirits, and whilst the syringe is in our hand we throw a little into the rectum, and perhaps, also, by a small aperture, into the cavity of the peritoneum. The whole process will, at the utmost, occupy a quarter of an hour? Every school of anatomy has a professed injector, and in all probability it would not take him half so long. Now what is the trouble, similarly estimated, in employing what Dr. Marshall calls a "much more simple remedy?" I will quote his words: "The body must be punctured over the whole surface with acupuncture needles, or the point of a narrow bistoury, scalpel or scissors, the punctures being made pretty closely together, and deeply over the fleshy part, and, if for a dried arterial or venous preparation, the punctures ought to be made with very fine needles, and after injection." It is not very easy to ascertain the time that would be thus consumed. But let it not be imagined that the work is now finished. I quote again: "This being done, the body is brushed over with acetic acid, sp. gr. 1048, which must be brushed into it slowly and repeatedly, so that the acid may fully penetrate the innermost parts," and further "repeating the application of the acid to the surface of the body for six or eight days, will not only preserve it free from putrefaction, but at the same time remove incipient greenness." We are thus left to conclude that, without this repetition, it would not be perfectly preserved, and consequently that the repetition is necessary. Multiply therefore the slow and repeated brushing above-mentioned by eight, and then to the product add the scalpel, narrow bistoury,

scissors, acupuncture needle, or very fine needle puncturation, and you will find a sum of trouble which, measured by time, might perhaps be fairly represented by a long summer's day. We have ceded the first point. Dr. Marshall must, in candour, allow that we have the advantage of him on the second. We now approach the third, by far the most important of the three.

3. Comparative efficacy.—Dr. Marshall on this head does not assume superiority, but contends that "his remedy" is equally efficacious as ours. We venture to differ from him, for the following reasons:—

1st, His method, besides disfiguring and destroying the skin, which is objectionable in itself, renders the body unfit for injection, so that it must be performed prior to this operation. Ours does not, for wax or any other material may be injected at any time after its adoption.

2ndly, His scalpel or bistoury incisions, "over the whole surface, pretty closely and deeply over the fleshy part," must necessarily divide, not only muscular fibre, but nervous filaments, and thus materially interfere with the prosecution of minute anatomy. The needles, it is true, are less objectionable in this respect than the cutting instruments, but their employment must be far more troublesome.

3rdly, The acetic acid turns the flesh white. "The whole of the parts into which the acid had been brushed were perfectly restored to whiteness:" our process leaves the parts of their natural colour.

4thly, An acid preparation of any kind must greatly injure the blades, and immediately destroy the edge of dissecting instruments; and acetic acid of sp. gr. 1048, would even, I should suppose, after no very long period, remove the cuticle from the dissector's fingers, that being the precise strength of the strong acid of the London Pharmacopœia as employed for cauterizing warts, destroying ring-worm, &c.

[*Dr. Marshall, in a reply, assents, in nearly all respects, to Dr. Babington's statements.*]

ACTION OF GREAT FIRES PREVENTING THE FORMATION OF STORMS.

BY M. MATTENCI.

M. Mattenci had noticed the custom recently established in a parish in Romagna, of kindling great fires with this view, and remarked that during three years that this practice had been followed, the parish, previously ravished every summer by hail, had been spared, while the neighbouring parishes had not been. M. Arago thought that more legitimate conclusions might be drawn from observations made in countries where a great number of high furnaces and smelting houses are met with, as in certain parts of England; but the presence of metallic veins is a complication which necessarily interferes with the results observed. M. Mattenci on this occasion pointed out a locality in which the influence of metallic veins does not complicate that of the great fires. In travelling in the Apennines he found that the cantons in which charcoal and sulphur were manufactured never suffer by hail.

III. PHARMACY, &c.

COMPARATIVE EFFECTS OF OPIUM AND ALCOHOL.*

The object of a paper read by Mr. Downing, was chiefly to point out the injurious effects which opium taken habitually, either by being swallowed or by inhalation, exerted upon the physical and mental energies. With this view, he advanced a great number of facts from the works of various Eastern travellers, the accuracy of whose descriptions he had been able to verify by personal observation. It is unnecessary here to give the often-repeated catalogue of evils which beset the habitual consumer of opium. With reference to the comparative effects of opium-eating and spirit drinking, the author remarked, that they resembled each other in many respects, as would at once be perceived; the points in which they differed, however, were not so perceptible to ordinary observers. They both stimulated the nervous system to an unnatural degree, and when the pleasurable sense of excitement was over, they both left a relaxation of the nervous system, and an undue depression of both the bodily and mental powers. They both disordered the digestive functions, predisposed to other diseases, and materially shortened the period of life. In order to keep up the same degree of excitement, a greater quantity of each must be used, the oftener it was indulged in; so that, if once the appetite were formed, constantly increasing indulgence was necessary, and almost inevitable. The desires were the only standards for estimating quantity. They both stupified and deranged the intellectual powers, and debased the moral attributes. All the injuries inflicted by alcohol, however, the author considered were increased in a tenfold degree by the use of opium. In one, there was a limit to the quantity taken ; in the other, the quantity was unlimited. The spirit drinker had some short intervals of repose ; the swallower of opium none, his being a life of perpetual excitement. In one, the habit might be broken off—many a drunkard had been cured of his propensity to intoxication ; but there was scarcely one known instance of escape from the toils of opium, when once they had firmly enveloped a man. Opium eating, he believed, was increasing in this country.

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* *Report of Proceedings at the Westminster Medical Society;* from "*The Lancet.*"

Dr. Johnson directed attention to the kind of intoxication produced by spirits or wine. The party were quarrelsome, bustling and noisy, so contrary to the effects which were produced by opium. When the opium smoker had taken in his whiff, he sate as still as marble for four, six, or eight hours, apparently in the deepest reverie ; this was not the case with wine. With reference to the increased consumption of opium in this country, he might mention that the insurance offices had found that the sale of opium had increased in a direct ratio with the increase of teetotalism !

Mr. Snow considered that alcohol was a simple stimulant, whilst opium had two distinct properties, that of a stimulant and that of a narcotic. The effect of spirit, including wine and malt liquors, which contained it, was the opposite of that of the sedative or contra-stimulant medicines, such as digitalis, green tea, antimony, the acids and neutral salts. Opium was, undoubtedly, likewise a stimulant ; he had remarked it to produce a striking effect on the heart's action in a case of delirium tremens, and the increased force of the heart was continued, during the sleep which was induced, and even afterwards. It was also a narcotic, as was proved by its well-known power of alleviating pain, and procuring sleep. That a narcotic power was quite independent of that of a stimulant, was clearly shown in hyoscyamus and conium, which, so far from being stimulants, were positively sedatives. The narcotic property of opium appeared to reside in the morphia, and the stimulating one in the narcotine. The case of an opium-eater who found hyoscyamus and conium no substitute for his opium, was interesting, as proving the difference between a stimulant and a sedative narcotic. These medicines were too apt to be prescribed, without attention to the indications which might always be gained from the pulse and heart.

Mr. Verrall considered that both the agents in question acted, first, as stimulants, and secondly, as narcotics. The feelings which predominated on the day following intoxication, by opium or morphia, were similar to those which were present when the state of inebriation had been produced by wine : opium seemed to act on the nervous system chiefly, alcohol on the vascular.

Dr. Burgess was of opinion that the habitual use of opium was more prejudicial than the constant indulgence in the use of ardent spirits. Opium-eaters were wasted, and prematurely aged.

Dr. A. T. Thomson said that all stimulants, by exhausting the nervous energy, and thereby producing sedative effects, were, necessarily, narcotics ; but the difference between opium and alcohol consisted in the anodyne properties of the former, and its power of relieving pain in a part remote from that to which it was applied, a virtue which was not possessed by alcoholic liquors. Opium in large doses acted as a direct sedative, whilst alcohol in the same proportion would produce a powerful inflammatory state of the stomach ; opium produced no such inflammation. Opium appeared to act upon the nervous system almost entirely ; while alcohol excited the vascular system. He had known many opium-eaters, who were reduced to a species of mummies. Opium eating, he contended, shortened life, but not so decidedly as did ardent spirits, the latter producing hepatic disease more rapidly and more frequently.

ABORTION WITH SYMPTOMS OF POISONING PRODUCED BY THE USE OF RUE.*

BY M. TH. HELIE.

A young girl, of short stature, but robust constitution, who had had a difficult labour at the age of sixteen, brought on a miscarriage in the following way. She sliced three fresh roots of rue as large as her finger, and boiled them in a pound and a-half of water, down to three cupfuls, which she took in the evening at a draught. She was immediately seized with acute pain in her stomach, which was soon followed by so great and general a feeling of faintness, that she thought she was going to die ; she saw every thing as through a mist, tottered, and felt giddy, as if intoxicated. Violent and continued efforts to vomit soon came on, which continued the whole night. Colick pains, at first slight, but afterwards more severe, were experienced the next day. Towards the evening of the second day they became violent, and followed one another in quick succession. Now small discharges of blood from the vagina, then large clots, and in a few minutes afterwards abortion took place, forty-eight hours after the decoction of rue had been swallowed, the girl not having been confined to her bed. The unpleasant symptoms caused by the rue went off in a few days.

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* *Annales d'Hygiène*, vol. xx.

Another case was that of a young girl who had been four or five months pregnant, but, wishing to induce abortion, took large doses of the expressed juice of fresh rue leaves for several days. The symptoms induced very much resembled those of the former cases. Somnolency, prostration of strength, fainting, slowness of pulse, coldness of skin, and jactitation of the limbs, were all observed. Swelling of the tongue, with copious salivation, was also noticed. Abortion did not take place till the sixth day from the beginning of the manifestation of the symptoms of poisoning. The symptoms of poisoning, however, lasted for twelve days, when they abated, and the girl recovered.

POISONING FROM THE EXTRACT OF ACONITE.*

The *Gazette Medicale* gives accounts of the death of two persons, and of the serious illness of several others, in consequence of their having been taking an alcoholic extract of the Aconitum napellus, for the cure of rheumatic pains, of much stronger powers than that which had been previously administered, although the doses had not been increased in quantity.

The facts stated sufficiently point out the necessity of the greatest caution in the administration of poisonous vegetable extracts from different parcels or quantities prepared at different times, and perhaps under different circumstances. The physician will act wisely to diminish the dose of such drugs, whenever a fresh parcel or quantity is used for the first time.

POISONOUS SYMPTOMS FROM THE BITE OF A SPIDER.†

BY DR. HULSE.

On the 7th of August, a gentleman, when in the water-closet, received a bite from a spider on the penis. The pain, which was not great at the moment, continued to increase in severity till an hour afterwards, when it became so intense that Dr. Hulse was sent for. The patient was found writhing under the most acute suffering, though the seat of the bite showed no marks of irritation or swelling. Very shortly afterwards, violent vomiting came on, attended with deep-seated pain in the region of the abdomen, extending to the chest, and with occasional convulsive paroxysms of suffocation. The vessels of the face and neck were greatly distended, and of a dark hue. Blood was abstracted freely from the arm, and teaspoonful doses of laudanum and *aqua ammoniæ* were given every ten minutes, but almost immediately ejected from the stomach. Spasm of the muscles of the spine and of the extremities now came on, and the agony and anxiety were much increased. Tincture of cantharides, strong ammonia liniment, and spirits of turpentine, were applied to every part of the body; and the ammonia and laudanum, with the addition of some tincture of camphor, were administered internally. Three hours after the accident, the paroxysms of pain came on at longer intervals, and the vomiting was less urgent, but the intensity of the pain during the paroxysm was undiminished. Frequent injections had been given, but it was not till five hours after the accident that feculent matters were passed. The patient became much easier in the course of the evening, and a dose of castor oil was retained on the stomach, which purged him freely. The pains in the legs, however, continued, and prevented sleep. Sinapisms were next day applied without relief. Veins in both feet were therefore opened, and blood was allowed to flow till an impression was made on the pulse. The pains left about an hour after this; he passed a quiet night, and rapidly recovered.

The spiders in the water-closet were of a large size, of a dark-brown colour, and covered with hairs over the body and legs.

STATISTICS OF POISONING IN ENGLAND.*

The following digest is taken from a Parliamentary document, entitled, "Returns from the Coroners of England and Wales, of all Inquisitions held by them during the years 1837 and 1838, in cases where Death was found, by Verdict of Jury, to have been caused by Poison."

Arsenic.	184
Taken by a girl disappointed in love	1
By a girl, in a fit of passion	1
By a girl, in a fit of jealousy	1
By a girl, who had robbed her master's son	1

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* *Gazette Medicale.*

† *American Journal of the Medical Sciences*, May 1839.

* From *The Lancet.*

By a girl, seduced and deserted by a married man	1
By a girl, subject to fits of despondency	1
By pregnant girls, to destroy themselves	5
By a pregnant girl, to procure abortion	1
By a pregnant girl, deserted by her lover, who was suspected to have procured her the poison	1
By a pregnant girl, how or by whom administered not known	1
By a wife, separated from her husband	1
By a young woman, married unhappily, and separated from her husband	1
By a cook maid, distressed by the death of a friend	1
By an insane mother and two children, administered by the former	3
By five children, to whom it was administered by an insane mother	5
By a man, embarrassed by debt, and disordered in mind and body	1
By men, through reduced circumstances, pecuniary embarrassments, &c.	6
Taken through drunkenness	12
By a farmer and innkeeper, who, having had a handsome legacy left to him, spent it in riotous living, got into debt, and took poison to escape his creditors	1
Through poverty	3
Through despondency	1
In lunacy	52
In food, by accident	7
In mistake, by young people, in food prepared for vermin	5
In mistake, by a married woman, who, having mixed it with oatmeal for vermin, was innocently supplied by her husband with food prepared from the mixture	1
By accident, the deceased having tobacco and arsenic loose in the same pocket	1
In mistake for cream of sulphur	1
Administered to a child in mistake for magnesia	1
——— Queen's cordial	1
Taken inadvertently in various ways	3
Administered wilfully	5
How administered not known	2
Felo de se	23
Taken without cause assigned in the report	36
Opium	42
Overdose, taken by adults in ignorance	11
Overdose, administered to children, by mothers and nurses	8
Administered to a child, in mistake for other medicine	1
Supplied by a deaf druggist for manna, and administered to a child by an ignorant nurse	1
Administered to a child found dead in the Trent, extensively bruised (the poison and the wounds both sufficient to account for death)	1
Taken by a child in ignorance	1
Taken through drunkenness	2
Through lunacy	9
How administered not known	1
Felo de se	2
Taken without cause assigned, &c.	5
Laudanum	133
Administered by mistake	2
——— for antimonial wine	1
——— for paregoric	2
——— for Godfrey's cordial	2
——— for syrup of buckthorn	1
——— for tincture of rhubarb	4
Sold at a druggist's for antimonial wine—the druggist not bred to his trade, and kept two shop-girls, one of whom (the coroner ascertained) gave twice as much laudanum for a penny as the other	1
Taken by adults as medicine	11
An overdose, taken by a drunken surgeon	1
Taken by mistake for a surgeon's draught	1
Administered to children in mistake	2
Drunk by a child, within whose reach the phial had been left	1
Given by a child to an infant, to allay coughing, in the mother's absence	1
Overdose to infants, by mothers and nurses	26
Taken inadvertently	7
Through despondency	4
Through drunkenness	9
Through dissolute conduct	1
Through lunacy induced by want	2
Through do., from various causes	30
Through loss of situation	1
Wilfully administered	2
How administered not known	2
Felo de se	4
No cause assigned, &c.	14
Cough Syrup	1
Overdose, given by a mother to her child	1
Syrup of Poppies	5
Overdose, administered to children by mothers and nurses	5
Godfrey's Cordial	12
Overdose, administered to children by mothers and nurses	10
Administered to children by mistake for syrup of rhubarb	2
Infant's Mixture (*most probably a preparation of Opium*)	1

Overdose given by a mother to her child	1
Morison's Pills	1
Taken as medicine	1
Tartar Emetic	2
Three drachms, taken to cure the ague	1
Overdose, given to an infant	1
Colchicum	3
Overdose, taken for the gout	1
Taken as medicine	2
Mixture for Vermin	2
Taken by children, within whose reach it was left	2
Hellebore	1
Taken by a "temporary lunatic"	1
Mercury	2
Taken by a "temporary lunatic"	1
Felo de se	1
Bichromate of Potash	1
Eaten ignorantly by a child	1
Aqua fortis	2
Drunk by a child, within whose reach it was left	1
Taken in temporary lunacy	1
Oxalic Acid	19
Taken by a woman who had quarrelled with her husband	1
By a person of defective intellect	1
Through lunacy	8
Through drunkenness	1
Through want of employment	1
By a young woman, on the emigration of her brother	1
By a child, within whose reach it was left	1
Without cause assigned	5

⁂ It is singular, that nearly the whole of the cases of poisoning by oxalic acid occurred in Middlesex.

Nitrate of Silver	1
By a child (swallowed percussion caps)	1
Castor Oil Seeds	1
Taken inadvertently	1
Fungus	4
Eaten for mushrooms	4
Rum	1
Ignorantly given to a child for inflammation of the bowels	1
Extract of Lead	1
Found in solution by a woman, and given to her child in mistake for ginger-wine	1
Essential Oil of Almonds	4
Taken in lunacy	2
Without cause assigned	2
Prussic Acid and Arsenic	1
Taken in lunacy	1
Arsenious Acid	1
Taken in mistake for a purging powder	1
Acetate of Morphine	2
Administered in mistake for other medicine	2
Strychnine (*the active principle of Nux Vomica*)	2
Taken by a child, to whose father it had been sent as a medicine	1
Lunacy	1
Nux Vomica	3
Taken in ignorance of its effects	1
Procured by a girl of weak intellect, and given to her father, who had sent her for an emetic	1
Taken without cause assigned	1
Wolf's Bane	1
Eaten by a child, who found it in his father's garden	1
Black Ashes	1
Procured for washing, and eaten by a child	1
Sulphate of Iron (*Copperas*)	1
Taken to procure abortion	1
A Vegetable Poison	3
Taken by two children (brothers)	2
By an adult	1
Hicrapicra	1
An overdose, taken in gin	1
Monk's Hood	1
Gathered by a poor old man, and eaten in mistake for celery	1
Savine	1
Taken to procure abortion	1
Infusion of Hemlock	1
Overdose, taken by a woman	1
Laudanum and Prussic Acid	1
A case of lunacy	1
Potash	1
Taken by a child	1
Medicine	1
Administered to an infant—intended for an adult	1
Muriate of Tin	1
Taken by a child in mistake for vinegar	1
Cantharides	1
An embrocation, containing tincture of cantharides, administered to a child in mistake	1
Laudanum and Aquafortis	1
Lunacy	1
Carburetted Hydrogen Gas	2
Inhaled during sleep, through an accidental escape of gas	2
Belladonna (*Deadly Nightshade*)	2
Taken by mistake	1
Without cause assigned	1
Paregoric Elixir	2
Overdose, administered to children	2
Decoction (*nature not exactly known*)	1
Taken by a pregnant girl, with the supposed intention to procure abortion	1
Nitrous Acid, with Aloes	1
Taken without cause assigned	1
Cayenne Pepper, &c.	1

Cayenne pepper, essential oil of Cayenne, and bark, taken in alcohol, as a remedy for the ague	1	
Turpeth Mineral		1
Taken in mistake	1	
Sulphuric Acid (Vitriol)		32
Swallowed by children, ignorantly	9	
——— for ginger beer	3	
Administered to children for Godfrey's cordial	4	
——— a child for castor oil	1	
——— for syrup of rhubarb	1	
——— for some medicine not named	1	
Accidentally sold for Godfrey's cordial, and given as such to a child	1	
In a drunken fit	1	
Through insanity	5	
Through family quarrels	1	
By a woman, who thought herself forsaken by God	1	
Without cause assigned	4	
Hydrocyanic (Prussic) Acid		27
Taken by surgeons, depressed in mind by reduced circumstances	2	
By a surgeon delirious from scarlet fever	1	
By a surgeon, addicted to drinking	1	
By a surgeon, in a fit of frenzy	1	
By druggists, deranged	2	
By a medical student, affected by over-study	1	
By a child, in ignorance	1	
By a gentleman, reduced from affluence to poverty, and deranged	1	
Through disappointment in love	1	
Through lunacy	2	
Without cause assigned	6	
Corrosive Sublimate		12
Taken incautiously as medicine	1	
By mistake, for cider	1	
In a fit of passion	1	
Through despondency	1	
Through lunacy	5	
Felo de se	2	
Without cause assigned	1	
Poisons not specified		14
Taken accidentally	12	
By a drunkard, in mistake	1	
Case of miscarriage, the mother having received some noxious drug	1	

Gateshead Observer.

STATISTICS OF POISONING IN DENMARK.*

Ninety-nine cases of poisoning occurred in Denmark from 1830 to 1835; sixteen by arsenic, seventy-four by sulphuric or nitric acid (generally diluted), four by caustic potash, one by an undetermined caustic, two by opium, one by litharge, and one by verdigris.

Of the sixteen cases in which arsenic was taken, four were suicidal; in three it was intentionally given by others; in three it was taken by mistake; and in six it was uncertain whether it had been taken by mistake or not. In one case an arsenical ointment, which had been intended for a different purpose, was used for poisoning. Of the seventy-four cases of poisoning by sulphuric or nitric acid, fifty-seven occurred in Copenhagen, and seventeen in the provinces. Among the latter, suicide was attempted or effected in thirteen instances; twice, the poison was given by others; and thrice, the poisoning occurred through a mistake. The two cases of poisoning by opium were both suicidal; one was an apothecary's apprentice, and the other an hysterical woman, for whom laudanum had been prescribed as a remedy.

The case of poisoning by litharge, occurred through mistake; but it is to be observed that symptoms of poisoning by litharge have hitherto not been uncommon in Denmark, as the peasants use it to sweeten their sour beer. In 1838, three such cases though not fatal ones, occurred near Friedrichsburg, so that the public has become aware of the injuriousness of the practice, and measures have been taken to prevent it by law. The case of poisoning by verdigris was caused by a solution in brandy. It was uncertain, however, whether the symptoms had been caused by the trifling quantity of verdigris which was found, or by great errors in diet. The cases of poisoning by caustic occurred through mistake.

DETECTION OF ARSENIC IN THE BLOOD, FLESH, AND VISCERA, AFTER DEATH FROM POISONING.*

M. Orfila, to determine whether the presence of arsenic can be detected in the blood and the solid parts of the body after death, in cases of fatal poisoning, has proposed a new process, which he deems to be a great improvement on the former one.

Take the liver, spleen, lungs, or a certain quantity of the blood of the animal that has been poisoned with arsenic, and dry them thoroughly. The dried mass is then to be treated in the heat with concentrated and purified nitric acid; in the course of a quarter of an hour or so, the whole mass will be dissolved. The liquor is concentrated; a dark point appears, and soon the carbonization is complete. It is then to be treated with cold water. The solution is introduced into Marsh's apparatus, and submitted to the hydrogen test.

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* *Zeitschrift für die gesammte Medicin.*

* *Memoires de l'Academie.*

In performing the experiments, we must carefully be upon our guard not to raise the temperature of the mixture too high, and also not to use too large a proportion of nitric acid. If more than sufficient be used, the flame is too vehement, and almost all the arsenic will be destroyed. Again, if the heat applied be not sufficient, the carbonization is not complete, and a disagreeable pyrogenous odour, similar to that of burnt horn, is emitted. Several hours are required for the experiment; and sometimes, even with the greatest care and dexterity in performing it, a portion of the arsenic is lost.

The following are the proportions of nitric acid recommended by M. Orfila, to be used with the different parts of the body submitted to the experiment. For three ounces of dried blood, seven ounces of the acid are required; for one ounce of dried gelatine, one ounce of acid; for three ounces of the residue obtained by decoction of the limbs, nine ounces of acid; for six ounces of dried cerebral matter, four ounces of acid; and for all adipose matters, a very large proportional quantity of the acid is necessary. Twelve ounces of dried liver require thirty-four ounces of acid; whereas twenty-two ounces of muscle require only sixteen ounces.

By following the proportions now given, provided at the same time care has been used in effectually drying the substances submitted to experiment, we are sure almost of constant success. We may not indeed succeed in recovering all the poison, but much less will be lost in this than in any other way.

THE OXIDES OF IRON AS ANTIDOTES OF ARSENIC.*

M. Bunsen proposed the hydrated peroxyde of iron in a moist state as an antidote to arsenical poisoning; and the value of the remedy has been confirmed by several other experimenters. As the compound formed by the union of the two metallic salts is quite insoluble and inert, there is every reason to believe that, if a complete union could take place in the stomach when the poison has been swallowed, and before it has produced its deleterious effects, many lives might be saved. The only objection against the moist peroxyde is the tediousness of preparing it, its inconvenient bulk, and the difficulty of keeping it for a length of time. The mode of preparing it is by peroxydising a solution of sulphate of iron by the means of nitric acid with the aid of heat, and then adding pure liquor ammoniæ: the supernatant liquor is to be drawn off the flocculent precipitated peroxyde; and fresh water must be poured on it, and decanted off several successive times. The process requires four or five hours.

A committee was recently appointed by the Society of Medicine to examine the subject in all its details, and to endeavour to discover a substitute for the moist peroxyde recommended by M. Bunsen. The report of this committee says:—We do not hesitate to assert that the effects of the arsenious acid are successfully opposed, not only by the moist peroxyde of iron proposed by M. Bunsen, but still more effectually and more easily at the same time by the dry hydrated peroxyde—the subcarbonate of iron of the chemists. This is readily prepared by precipitating the proto-sulphate of the metal by carbonate of potash, and washing the precipitate repeatedly. By exposing it freely to the air during desiccation, it becomes completely oxydated, loses its carbonic acid, and is then in short a dry hydrated peroxyde:—100 drachms of this precipitate, when calcined, yield 69 drachms of an anhydrous peroxyde.

In numerous experiments performed by the reporters, its antidotal efficacy was very remarkable when the dose of the poison had not exceeded four or six grains. The first thing to be done is to encourage vomiting as freely as possible. But in doing this, the patient should be made to drink copiously of milk or of oil, and not of water, to prevent the further solution of the poison. Whenever the vomiting is carried as far as is deemed adviseable, a quantity of lukewarm water, in which several ounces of the dry peroxyde of iron are suspended, should be administered. If it is rejected by vomiting, so much the better; we have only to repeat the dose immediately.

The committee suggest that half an ounce of the dry peroxyde should be given for every grain of the arsenic that may be in the stomach.

It is mentioned in the report that *small doses of arsenic*, say four or six grains, *proved more quickly fatal than larger ones*, as from 12 to 40 grains. The absorption seems to go on more rapidly when the dose is small.

HYDRATED PEROXIDE OF IRON AN ANTIDOTE TO ARSENIOUS ACID.*

A young lady, disappointed in love, resolved on suicide. She took a packet of arsenic containing two drachms, put it into a silver vessel, poured over it about two ounces of water, and drank the fluid contents. This was about midnight. She then went to bed; but finding death not approaching, she took some of the poison which remained at the bottom of the vessel, and endeavoured to push it down her throat, but its bitter taste, she said, made her spit out a part of it. She must, however, have taken about fifty-six grains of arsenious acid. At one in the morning, the first symptoms of poisoning manifested themselves by several attempts at vomiting and by a feeling of burning heat in the throat and in the region of the stomach. It appeared that the patient had that day ate a hearty dinner, the digestion of which had not apparently been finished, as the vomiting brought up a portion of it, and probably also some of the poison. The pain soon became violent, followed by cramps in the calves of the legs.

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* *Revue Medicale, as quoted in the Medico-Chirurgical Review.*

* *American Journal of the Medical Sciences*, May 1839.

Dr. Deville saw the patient at four o'clock in the morning. She had vomited three or four times; she had intense frontal headach, and her face was much flushed; her eyes were greatly swollen, and filled with tears; and she complained of a feeling of suffocation, and also of acute burning pain in the throat and stomach. Her pulse was strong, full, and bounding. Dr. Deville thought he had arrived too late to render effectual assistance, and gave only some milk and other drinks to aid the vomiting, and applied a poultice over the region of the stomach.

The symptoms progressively increased in intensity, and Dr. Delons was sent for, who proposed to give the hydrated tritoxide of iron. This medicine was procured by half-past five, five hours and a-half after the taking of the poison. It was given in ounce doses about every quarter of an hour, till eight o'clock, by which time nearly half-a pound had been taken. It was then discontinued, as it had produced vomiting several times, and had purged twice, and as the symptoms appeared to be abating. She still, however, suffered from violent cramps, particularly in the left leg. The pulse still continued full and bounding; the pains in the epigastrium were at times insupportable, and then again almost disappeared. Twenty-five leeches were applied over the stomach, followed by cataplasms; and emollient injections were administered at intervals.

Feverish symptoms, with violent headach, continued for this and several succeeding days, preventing the patient from enjoying a moment's repose. The pain in the epigastric region, however, diminished under the use of warm baths and soothing treatment; and at the end of eleven days she had completely recovered.

UVULARIA PERFOLIATA, AN ANTIDOTE FOR POISONED WOUNDS.*

BY B. H. COATES, M.D.

The *Uvularia perfoliata*, *Hieracium nervosum* (*venosum*), and several other plants are in common use among the American Indians as antidotes to the poisonous symptoms produced by wounds inflicted by the poisonous snakes.

Dr. Coates relates in detail a case of the efficacy of the *Uvularia* applied topically to the wounds inflicted by a copper-head (*Trigonocephalus contortrix*), one of the most poisonous of the American snakes. Immediately after the bite, which was situate about two inches above the instep, a ligature was applied firmly above the knee, and a quantity of the *Uvularia perfoliata* bruised with vinegar and salt, was applied over the seat of the bite. The wound, which was at first intensely painful, became soon after quite free from pain unless when touched. The limb was quite benumbed, and was enormously distended with œdematous swelling as high as the ligature; masses of effused blood were visible over the top of the foot and in several parts of the leg; the skin was white, shining, and cold. Suction was afterwards made over the bite for about half an hour with a tobacco pipe, and ammonia was administered internally. The ligature was continued for nearly thirty hours, when symptoms of threatening mortification of the limb caused it to be removed. The child, a girl about five years of age, was then freely purged, when the swelling rapidly abated, and three days afterwards she was running about as usual.

Dr. Coates is of opinion that "death rarely, if ever, takes place from the direct effects of the bite in human adults. Thus, that which had been ascertained by Fontana with so much labour in regard to the viper, and rendered so probable by Russell, as to the *Cobra di capello*, and other Indian serpents, seems also to be established in regard to our rattlesnakes."

Dr. Coates remarks, that the appropriate treatment is "a moderately tight ligature, and suction with some force for a prolonged period;" and he is of opinion it would be sufficient if these were continued for a period of six or seven hours. He thinks it would be right to make still further trials of antidotes, though the facts above related go far to explain the cause of the doubtful reputation of the various remedies for the bites of poisonous serpents.

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* *American Journal of Science*, vol. xxxv. 1839.

TOXICOLOGICAL MISTAKES.*

Many substances prove poisonous, which are not commonly supposed to be so.

Lately in the North of England, a girl died in consequence of having taken more than half a pound of *common salt* as a cure for worms. This is not unprecedented; for in September 1828, a man in London having undertaken to swallow a pound of salt with a pint of ale, performed the feat, but was seized with the symptoms of irritant poisoning, and died within twenty-four hours. The stomach and intestines were excessively inflamed.†

Dr. Christison enumerates several other substances, which though not commonly reputed poisons, have proved so in reality. The *sulphate of iron* is one of these. A girl having taken an ounce in beer was seized with cholic pains, vomiting, and purging, that was cured by mucilaginous and oily drinks. In a document headed "Deaths from Poison,‡" one death is put down to sulphate of iron; but it is merely stated that it was taken to procure abortion, and no account is given of the symptoms.

In another case, a large *quantity of pepper* (from an ounce and a half to two ounces) produced a gastritis, from which, however, the patient recovered.

Even *Epsom salts* appear to have caused death. A boy, ten years old, took two ounces, and had hardly swallowed the medicine before he was observed to stagger and become unwell; and in forty minutes more he was dead.‡ The dose was certainly too large; and as the boy was probably weakly (being supposed by his father to labour under worms), some hypercartharsis might reasonably have been expected; but as there was no purging or vomiting, the immediate prostration of nervous energy in this case would seem rather to have been an accidental coincidence than a result of the medicine;—yet it is just possible that in this unique case the irritability of the stomach was so exquisite that even the stimulus of Epsom salts was unbearable.

A man who was employed in Morison's pill manufactory, having got drunk on a Monday, endeavoured to cool his stomach the next day by taking an enormous quantity of *cream of tartar*, and died on the Thursday. The quantity taken is uncertain: the patient himself merely said that he had swallowed four or five table-spoonfuls. This would be only four or five ounces, unless we suppose heaped measure to be intended. Both the stomach and bowels were much inflamed. In this instance, the gastritis caused by the liquor seems to have been fatally aggravated by the bitartrate of potash; so that the unfortunate patient fell a victim to the joint action of the poison, and of what he imagined to be the antidote;—for it is clear that spirituous drinks, when in large quantities, or not sufficiently diluted, must be reckoned among the poisons of which we are now speaking—among those, namely, which may destroy life with rapidity, though not popularly supposed to possess this power. Among the more remarkable observations made by Dr. Beaumont, on the digestion of Martin, the Canadian hunter, he found that after hard drinking his stomach was not only inflamed but ulcerated.

Tobacco, again, is a substance which, though well known to every practitioner of physic to be poisonous, is used without caution by the public. Sometimes its dangerous powers, both acrid and narcotic, are seen when it is administered by the practical joker, as when Santeuil, the French poet, was poisoned by snuff put into his wine; and sometimes when it is given by quacks, or used as a domestic remedy. Thus Beck mentions a case where a woman, being persuaded by an empiric to use an infusion of tobacco as a clyster, to cure worms, was seized with convulsions, and died in a quarter of an hour. And Dr. Merriman informs us, in his notes on Underwood, that "a case of stupor, ending in death, occurred a few years ago, at Shoreditch, from the incautious manner in which a father washed the head of his child with a strong decoction of tobacco, for the cure of tinea."

Yet tobacco is daily smoked by countless thousands, without any immediate bad effect, except giddiness and vomiting in beginners; and this impunity makes the hasty conclude that the weed may be employed in every way, without caution; just as the use of the chloride of sodium at our table produces the mistaken conviction that it may be harmlessly swallowed in any quantity.

Camphor is often supposed by the uninstructed to be perfectly innocuous, though a scruple is a large dose, and forty grains a dangerous one. The error possibly arises from the frequent use of camphor mixture, which smells very strongly of the drug, though it contain so little.

In the Abstract of Coroners' Inquests above-mentioned, one death is set to *Hicra picra* (an aloetic powder) in gin; and one to cayenne pepper, essential oil of cayenne, and bark, taken in alcohol, as a remedy for the ague. In both these instances it is fair to suppose that the doses were excessively large; though the essential oil of cayenne would require to be doled out with a very frugal hand.

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* *From the Medical Gazette.*

† Christison on Poisoning, p. 491.

‡ Compiled from a report entitled "Returns from the Coroners of England and Wales."

There is another class of remedies—that of opium and its preparations, where mistakes are easily fatal, yet which are constantly given without medical advice. What is the consequence? Let the Abstract answer the question. It contains an account of 543 cases of poisoning. Among these, 11 were instances where adults took an overdose of opium from ignorance, and the same number where laudanum was taken as a medicine: besides two cases where it was given for paregoric elixir; four for tincture of rhubarb; one for syrup of buckthorn, &c. But there are no less than 72 cases where children were killed by overdoses of opium or its preparations, and from its being given by mistake for other remedies. In the first place, doses large enough to kill adults are administered by the stupid, or the drunken; secondly, the multitude are not usually aware how small a dose of opium will extinguish the slender flame of infant life; and thirdly, Godfrey's cordial, Dalby's carminative, and other soporific mixtures, are given to children without hesitation, and perhaps without suspicion of their being opiates. In the abstract, ten deaths are put down to over-doses of Godfrey's Cordial administered to children by mothers and nurses, besides four cases where it was given by mistakes instead of syrup of rhubarb. But in addition, the coroner of Nottingham states, that "Godfrey's Cordial is given to children to a great extent; and that he has no doubt whatever that many infants are yearly destroyed in that borough, but who, dying off gradually, never came under his care officially."

If such effects are produced by the abuse of opium, what would happen if the laity were to deal out the refinement of modern chemistry with their rude hands? In truth, we would recommend even practitioners of physic, when inclined to prescribe strychnia, or veratria, to remember the advice of the College, "viribus hæc induta violentis, haud temerè adhibenda est."

VALUE OF THE SIGNS OF DEATH BY HANGING.*

BY M. ORFILA.

M. Orfila, in consequence of the assertion of M. Devergie, that death by hanging could always be detected by the circumstance of spermatic animals being found in the urethra, and by the genital organs being congested with blood, made a number of experiments to determine this point. He found that in almost every dead body, no matter from what cause death resulted, spermatic animals were observable in the urethra; and in many cases they were found to be alive even six hours after death. In the living body, again, he detected spermatic animalculæ in the first urine which was passed after seminal emission, although even twelve hours had elapsed between the seminal emission and the passing of the urine.

With regard to the congested state of the genital organs, which is alone produced, according to M. Devergie, when death results from hanging, M. Orfila found, that hanging up a dead body several hours after death would always to a greater or lesser extent produce this congestion. In one of the cases which he relates, the person had died of disease of the heart, and though the body was not hung up till five hours after death, the penis was by this change of posture increased in diameter by nine lines, and actualy became so erected as to form a right angle with the body.

He concludes, therefore, that no faith can be put in the presence of spermatic animalculæ in the urethra, or in congestion of the genital organs, as signs of death by hanging.

DETECTION OF THE SPERMATIC ANIMALCULÆ.*

Dr. Bayard has, within the last year or two, followed out the suggestions of M. Orfila as to the evidence which might be derived from the microscopical examination of spermatic stains in certain medico-legal enquiries, and he has been enabled to correct the erroneous and unfavourable conclusion to which this distinguished physician had arrived.

By simply moistening the linen in water, contained in a watch-glass, for several hours and then heating it gently with a spirit-lamp, he succeeded in detecting the dead animalculæ without any difficulty. Along with these animalculæ may usually be observed some prostatic *monades:* these have a globular form and are without tails, and they are considerably larger than the genuine *zoospermes* or spermatic animalculæ, which, it is well known, have tails, and very much resemble in shape miniature tadpoles. The most important caution in conducting the above experiment is to avoid in any way bruising the animalculæ by rubbing or squeezing the linen. When this has been macerated for a sufficient length of time, Dr. B. sometimes filters the fluid, and thus procures all the solid matter on the surface of the filtering paper. He then takes a small portion of this and drops a little alcoholised or ammoniated water upon it for the purpose of dissolving its mucous portion, and of detaching the zoospermes from its surface: if any fatty matter is present, a few drops of etherialized water should be used. At the bottom of the fluid thus obtained, a deposit will quickly be perceived: of this a few drops may be sucked up by means of a small tube and placed on the object-glass of a microscope which magnifies 400 or 600 times.

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* *Annales d'Hygiène Publique*, October, 1839.

* *Annales d'Hygiène Publique.*

When thus examined, we usually perceive between the plates of glass several spots of a greasy aspect; it is in these spots that the animalculæ are generally observed. In other points we may notice numerous corpuscles suspended in the fluid, and perhaps also several of the animalculæ floating freely about.

There is another method that may be followed. A few drops of the fluid may be placed on a portion of glass and allowed to become dry; if it is now subjected to examination with the microscope, the zoospermes will be generally very easily detected.

Dr. Bayard, after giving a most minute account of the numerous experiments which he has performed; sums up the results of his observations in the following category of conclusions:

1. The spermatic animalculæ retain their life and movements, as long as the mucus, in which they are suspended, remains fluid and warm. He has found them alive during ten hours.

2. The semen, if allowed to become dry and then moistened, swells up and gradually diffuses itself in the fluid — the diffusion being more complete if gentle warmth be applied. By means of a powerful microscope the animalculæ, characterised by their long tails, may then be readily discovered.

3. To detect the spermatic animalculæ in spots upon linen, &c. we must take great care that it be not rubbed or squeezed either before or after maceration. By filtering the fluid of maceration, and then examining the deposit that remains on the filter we can generally detect the spermatic animalculæ uninjured, and with their bodies and tails perfect.

4. The presence of the animalculæ may be discovered in the mucus of the vagina, (provided the woman has no morbid discharge) for many hours after sexual intercourse.

5. Dr. Bayard says that he has been able to recognise the presence of the animalculæ *à longue queue*, entire and complete in every respect, on spermatic stains of from two to upwards of twelve months old.

TRANSMISSION OF VACCINE LYMPH BY THE PENNY POST.

To the Editor.

Sir—An official notification having appeared, that from and after the 10th of January, the Penny-postage system is to come into operation, I crave a small space in your valuable Journal, that I may inform your country readers that all applications for Vaccine Lymph, addressed after that day to the resident Surgeon at the Small Pox Hospital, London, shall receive the earliest possible attention.

The effect of this new system of postage, in bringing to the door of every medical man throughout the country a supply of Vaccine Lymph, *from various sources*, at the small charge of one penny, cannot but have a most remarkable effect upon the practice of Vaccination. I stated this very strongly to the Committee of the House of Commons, appointed to investigate the Post Office Question, and I now confidently look forward to the most favourable results. I am, Sir, your obedient servant,

George Gregory.

31, Weymouth-street, Dec. 28, 1839.

INOCULATION OF A LEPER WITH VARIOLA.

BY M. GUYON.

M. Guyon wrote to M. Flourens that he had performed this operation with success upon a Kabyle leper, from the mountains of Bongia. Although the parts upon which he operated were deprived of all sensibility, the disease followed the most regular course; after a local eruption remarkable for the developement of pustules, the most benign variola appeared upon the trunk and members.

ON BLISTERS.

BY M. TROUSSEAU.

In a letter addressed to his master, Dr. Bretonneau, the learned professor, after having spiritedly criticised those physicians who, always lost in the depths of nebulous and inapplicable theories, neglect the ordinary but useful details which often ensure the health of the diseased, gives to his brethren some remarks upon the various methods of applying blisters, which he has judged better than those commonly practised. We extract from his letter that which we think useful to be known by apothecaries.

THE BLISTER OF BRETONNEAU.

To prepare this blister, oil is mixed with the powder of cantharides, in such a manner as to give it the consistence of an electuary. A sheet of paper is then taken, in which is cut an aperture of the size and form to be given to the blister; this sheet of paper is then stuck upon a piece of adhesive oilcloth, afterwards, with a spatula, is spread in the circle formed by the sheet of paper, a layer of the epispastic mixture, of which the thickness should not exceed one or two millimeters; the sheet of paper is then raised, and in this manner the pomade remains upon the oilcloth, without superfluity and accurately circumscribed.

The cantharides are then covered with a piece of blotting-paper, which extends beyond them, and adheres to the oil-cloth. The oil-paper, impregnated with cantharidine, penetrating the blotting-paper, comes in contact with the skin, and these blisters join, to an extreme activity, all desirable cleanliness.

BLISTERS OF MR. JOHNSON.

Mr. Johnson takes the English blistering plaster of the Pharmacopœia, and when it is spread he rubs over it a light layer of the oil of cantharides in ether.

This oil is that which serves for the confection of blistering taffety; it is prepared in the following manner, according to the new Pharmacopœia.

Powder of cantharides, 1000 gram. 2 liv.
Sulphuric ether, a sufficient quantity.

Make an etherial tincture of cantharides by lixiviation in a movable apparatus; distil this tincture to drive off the ether; you will obtain from it a green, thick, and very vesicant oil.

Blisters thus prepared are very active; but Mr. Trousseau prefers the following to them:—

BLISTERS OF M. TROUSSEAU.

A piece of blotting-paper is cut of the form and size of the blister that is desired; it is applied upon a sheet of diachylon; and it imbibes some drops of the extract of cantharides by ether, and it is fixed upon the skin by means of the diachylon.

M. Trousseau has tried comparatively the action of different blisters; he has found that that which is prepared with the etherial extract of cantharides was the most energetic; the blisters of Bretonneau came next before the ordinary blister, and even the English one.

Another advantage which M. Trousseau found in his blister, is that of being very portable. "Indeed," says he, "I have lightly imbibed with the etherial extract of cantharides a sheet of blotting-paper, which I have kept in the dressing apparatus of the hospital in the open air for fifteen days. The time having expired, I examined it; on its surface were seen small silky needles of cantharidine; I applied a blister cut from this sheet; it took effect at the end of eight hours. You will easily agree, that for our brethren who practise in the country, and who are obliged to carry medicaments with them, it will be especially convenient to have in a pocket-book, and under cover, a large sheet of cantharidised blotting-paper, from which will be cut blisters as large as may be desired."

These blisters have acted in the space of from six to nine hours upon two women, and from seven to twelve hours upon ten men. The mean has been from eight to nine hours.

CASE OF POISONING BY NUX VOMICA.*

By R. DUNDAS THOMSON, M.D.

THIS case formed the subject of an inquest before the late Mr. Stirling. A young girl, named Sarah Crabbe, was brought in a coach to the University College Hospital. Her head hung down when seated on a chair; the face was pale; the eyes open and bright; the arms flexible. On feeling the pulse, Mr. Taylor pronounced, to the surprise of those around, that the body was lifeless. The cheeks, from an ashy paleness, became, two or three days after, of the natural florid colour. It appeared, in evidence, that the deceased had only been in the service of her master, a penmaker, a few days; she was then 18 years old, in excellent health, and very cheerful. About the middle of the week she applied to her master for some article wanted in the house: as she did not return, his wife missed her at a quarter before nine. After this hour no tidings were heard of her till half-past seven in the evening, when her father in law, who said he was a distant relation, called with another respectable man, and examined the drawers in the kitchen. Among other things a powder was found, said to be burnt alum, a tumbler washed out with soap suds, and a pail in which she had vomited a greenish-yellow matter, quite different to anything seen in common sickness. The deceased had stated to a little girl, a cousin of her master, that on the previous day, before breakfast, she had mixed up some sugar of lead to do her gown with, and had swallowed it because she was thirsty. It appeared from the evidence further adduced, that she had formed an attachment to a young man at Dartford, who rather slighted her. Three weeks before, she left her mother's house smartly dressed, had a new pair of boots on, and, without telling any one, walked all the way to Dartford to ascertain the cause of her sweetheart's silence. He was not prepared for the visit, procured a bed for her at a respectable inn, and sent her off, by a cart going to town, at 6 o'clock the next morning. A nurse, who gave her evidence, stated that she had known the young woman nine months. She came to witness's house, in Camden-terrace, at 10 o'clock; was very gay and cheerful; stopped the afternoon; said she came to take a cup of tea; talked over her future prospects; expected to be married very soon, and to go into business with a young man living in the country. About 4 o'clock she said, "I'll fetch some milk, nurse." She returned with it; they drank tea: about 5 o'clock the nurse went to fetch in some clothes drying in the yard; on returning, the young woman was seated in a chair; the nurse said, "Why, Sarah, you appear drowsy." She answered, "I am," and then exclaimed, "Oh dear, how ill I am; I have taken poison." She had got it, she said, from the chemist's just by. The chemist admitted he had sold her a pennyworth of nux vomica, a little while before, to kill rats. On going back from the chemist's, the nurse found her very ill indeed; left the landlady of the house to take care of her, and, after calling on four surgeons, found one who came to see her, and gave her a powder which made her vomit, and yielded her some relief. She fell on the floor; struggling dreadfully, violently; was placed on the bed; threw up a large quantity of blood, and nearly spoiled the bed. She was heard to exclaim, "Oh, what would I give to be saved!" In the coach she was very still and quiet, the violent struggles were over; as she was carried out of the coach she drew a deep sigh—her last. The verdict brought in was, "Poisoned herself in a state of temporary derangement."

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* From "*The Lancet.*"

Post mortem examination. (*From Mr. Taylor's Note-book.*)

The body fully developed, and exceedingly well-formed, covered with a thick layer of fat; pupils in the natural state; hair dark.

Head.—Dura mater presented, externally, several bloody points of considerable size; brain large; veins between the convolutions very much distended; a rather considerable effusion of blood within the cavity of the arachnoid, lying on the upper surface of the convolutions, especially in the right hemisphere. The congestion and effusion here were more marked than in more depending parts of the brain. Great congestion of the vessels of the pia mater; no liquid effusion under the arachnoid; the substance of the brain not so soft as might have been expected five days after death; cortical substance of a much deeper or browner gray than in health; white substance, on incision, exhibited numerous large bloody points of a darker colour than in health; a little serum near the lateral ventricle; choroid plexus congested; corpora striata of deep gray colour; cerebellum presented signs of congestion similar to those of the cerebrum, especially rather dark colour of the gray substance.

Chest.—Heart normal, containing little blood; calibre of the aorta small, embracing the point of the index finger soon after its exit from the heart; a little bloody serum in pericardium; lungs of a pretty uniform deep red colour, and tolerably filled with blood; a little bloody serum in left pleura; no sign of any disease in them.

Abdomen.—Lower half only of œsophagus examined. For two or three inches the mucous membrane considerably injected; then occurred an interval of paleness, after which it was red down to the termination. The stomach, of the usual size and form, contained a moderate quantity of fluid, in which, as well as adhering to its coats, was a considerable quantity of a darkish gray powder. The mucous membrane entire in its whole extent; not thickened; in its small curvature were lines of fine pink capilli-form injection; very considerable injection in the grand *cul de sac*, with many points of ecchymosis. The gray powder was adherent here in unusual quantity, as well as towards the pylorus, and which also presented similar morbid appearances.

Intestines, externally, of a red colour, apparently from imbibition; not further examined.

Spleen rather soft.

Liver and *gall-bladder.*—Nothing particular remarked.

Pancreas rather of a deep red colour.

Kidneys deep red, especially the tubular portion.

Bladder not examined; contains some urine.

Womb rather large; contained a good deal of gelati-form mucus. The mucous membrane, for half or three-quarters of an inch from fundus downwards, considerable congested. Left ovary converted into a serous cryst; none of the normal structure remaining; right ovary, one corpus luteum.

Chemical Examination of the Contents of the Stomach.

The quantity of the contents of the stomach, obtained for analysis, amounted to about a fluid ounce. It possessed the consistence of treacle, and exhibited the appearance of digested animal food or chyme. A similar mixture may be produced by digesting muscle, cut into small pieces, in some dilute acids, at a temperature equal to that of the human body. This is a point of interest, because it did not appear from the evidence that any food had been taken during the whole of the day, up to four o'clock P.M. The nature of the contents of the stomach, however, demonstrate that animal food had been swallowed. The odour of the fluid mass was strongly acetous; litmus test-paper, when introduced into it, was immediately reddened. A similar effect was produced when a portion of the matter was brought in contact with a solution of litmus in distilled water.

About one-half of the matter was introduced into a flask by means of a small tube terminating in a capillary aperture. The fluids thus mixed were boiled over a spirit-lamp for twenty minutes, two ounces of distilled water, acidulated with sulphuric acid, being previously added. It exhaled a strong smell of nutmeg; the whole was then thrown upon a filter; the solid matter* remaining on the filter was well washed with boiling distilled water. The liquid which passed through the filter was evaporated on the sand-bath, and mixed with some finely-powdered marble; the whole was reduced to dryness. This was pulverised and introduced into a flask; successive portions of alcohol were then boiled with it, until the spirit ceased to be coloured, and to afford a residuum on evaporation. The alcoholic solution was then filtered, the residuum washed, and the solution evaporated to dryness. The residue occupied the bottom of the porcelain basin, in the form of a thin brown coating, possessing an intensely bitter taste, which deliquesced in the air; this matter was again dissolved in alcohol. When caustic ammonia was added to this solution brown flakes fell in abundance. With nitric acid a yellow characteristic solution was formed. When evaporated, the brown residue possessed a powerfully bitter taste. I then tried the effect of sulphocyanide of potassium, and obtained indistinct crystals, but not of such correct delineation as to warrant the praise which Artus has bestowed upon this test. The former characters, however, sufficiently demonstrate that the substance under examination was strychnin.

A solution of the strychnin in alcohol was introduced under the skin, on the back of a full-grown green linnet, and a small portion of the powder was placed in its mouth. The bird soon began to be spasmodically affected in the legs and wings, and after some time died with symptoms of convulsed legs and wings, and retraction of the head.

Remarks.—In reviewing the preceding case, there are some points which deserve notice in a medico-legal point of view.

1. *The verdict.*—Was it a logical deduction from the facts brought forward in evidence? We cannot decide that an individual is insane from one single isolated fact; for insanity is a series of facts or acts properly inferred from an imaginary origin. There does not appear to have been any thing analogous, as far as the evidence goes, in the instance under consideration, and no one could have been justified in even suspecting the unfortunate girl of insanity, from any act which she had committed previous to the last awful step of which she was guilty. When the poison began to act, she regretted her crime, which was certainly nor characteristic of insanity. The rational explanation appears to be, that she had formed an attachment which was only temporarily reciprocal. Having boasted to various individuals of her love, her vanity was galled by her inability to demonstrate to her friends any return of affection from her reputed lover; and having corresponded with him, and receiving no answer to her letters, she paid him a visit, which was not well received. This circumstance preyed upon her mind in her solitude, and she erroneously reasoned that it was preferable for her to commit suicide than to survive an unreturned love and the taunts of her acquaintances. The cause of her crime was, a *false morality*, not *insanity*.

2. The only treatment adopted was an emetic. In the absence of a stomach-pump, it was proper to have recourse to this palliative. But in every case where nux vomica

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* The residuum on the filter was a coarse whitish brown powder; a portion was heated on charcoal before the blowpipe. Sulphuretted hydrogen was evolved, and metallic globules were speedily produced, which cut like lead, being quite soft. To prove the nature of the metal still more distinctly, a small portion was placed in a watch-glass, and covered with common aërated water. A white powder soon began to appear, which increased in quantity every day. It was soluble, with effervescence, in dilute nitric acid, showing that it was carbonate of lead. The powder, after digestion in water, was dried and exposed to the heat of a spirit-lamp; copious fumes of decomposed animal matter were evolved, and a gas was given out which caught fire and burned. A white powder remained, which, when treated by the process of reduction, was entirely converted into metallic lead. The various solutions and residue afforded no trace of the presence of alumina, showing that the alum, if any had been swallowed,. had been carried away from the stomach, while the lead, which had been taken nine hours before death, still remained. A case is noticed in the German journals where lead was found in the stomach three days after it had been introduced into that viscus.

has been swallowed, the stomach should be emptied of its contents completely, and then carefully and frequently washed out with lukewarm water. This treatment is necessary, because the insoluble powder becomes mechanically adherent to the coats of the stomach, and requires repeated and somewhat forcible efforts to remove it from its place. It is impossible to impress too strongly upon medical men the absolute necessity of their having always at hand this important instrument, and great readiness in its application.

3. The lead, which had been swallowed nine hours before death, was detected in the stomach in considerable quantity, showing that when a salt of lead enters into that viscus, it combines with the animal matter, and no longer exists in its original state.

OBSERVATIONS ON SYRUPS.

BY M. GUIBOURT.

The first observations of M. Guibourt relate to the proportion of water and sugar which enter into the composition of syrups, and the relation of the areometrical degrees which they indicate at different temperatures. It is commonly admitted that syrup brought by boiling to 30°, should indicate 35° when cold. This has been disputed by M. Pector, a skilful experimentalist, who has pretended that the real degree was only 34°, and that the syrup reached 35° on account of the evaporation which took place during filtration and cooling.

M. Beral, in some experimental investigations concerning the syrup of sugar, found the following results :

Simple syrup.		boiling.	cold.
With 28 ounces of sugar	.	30¼	34¼
,, 30 ,, ,,	.	31	35
,, 32 ,, ,,	.	31¾	35¾

Two inferences, says M. Guibourt, seem to flow from these results : first, that syrup brought by boiling to 30°, ought only to weigh when cold 34°, as Mr. Pector thought; next, that the syrup boiling at 30° contained less than 28 ounces of sugar, while it is generally admitted that it contains 32 ounces to 16 of water.

M. Guibourt wishing to resolve definitively these four questions so interesting to practical pharmacy, ascertained, by cooling syrup in a vessel accurately closed, that syrup brought to 30° by boiling, weighs exactly 35° when cold.

On the other hand, M. Guibourt dissolved in three different flasks, each of which had received 16 ounces of water 28, 30, and 32 ounces of well crystallized and perfectly dry sugar.

The specific gravity of the three syrups was determined at 17° centigrade, and was found :

	Density.	Areometric deg.
Syrup, with 28 ounces	1·311	34·20
,, ,, 30 ,,	1·320	35 weak
,, ,, 32 ,,	1·323	35·15

The syrup with 28 ounces appeared too fluid, and acquired in a few days, a disagreeable taste ; the syrup with 32 ounces was too thick, the syrup with 30 ounces appeared to be the true normal syrup ; this observation, contrary to received ideas, is very important to be remarked in the practice of laboratories.

ON THE GASEOUS CHALYBEATE WATER POWDER.

BY M. H. BRETON.

In a note which we published in the month of October of last year, upon the composition of the powders of M. Quesneville, one of our correspondents, M. Fage, (of Tulle,) laments that this M. Q. had not published his formula. Here is that given by the *Journal de Pharmacie* :—

Sugar	4 drachms.
Acid citrate of soda ..	1 —
Bicarbonate of soda ..	18 grains.
Double citrate of iron and soda..........	18 —

M. Breton, (of Grenoble,) wishing to make this mixture, and being unable to bring the citrate of iron and soda to such a state that he could mix it conveniently with the other substances, suspected some inaccuracy, and having analyzed some powder sent out from the shop of M. Quesneville, found, as M. Fage had already pointed out, that for the citrate of iron the sulphate of the same metal had been substituted. This is the result of his work. Sixteen grammes of the powder, which are the ordinary dose or a bottle, contain :—

Bicarbonate of soda....	3·200
Tartaric acid	3·616
Sulphate of iron	0·152
Sugar	9·032

He observes, like M. Fage, that the tartaric acid and bicarbonate of soda are mixed in the state of coarse powder, in order that, being dry, reaction might not take place ; the proportion of iron is here much weaker than in the first analysis published.

ON A NEW SPECIES OF QUINQUINA.

M. Guibourg made a very instructive report on a new species of quinquina, sent to the French Academy of Medicine by M. Lorenzana, minister of New Grenada at the court of Rome, and which was found to contain a great quantity of active alkaloid principles, which renders it very advantageous in therapeutics.

MARKET PRICE OF DRUGS.

	Duty	£	*s.*	*d.*
Acid, Oxalic	.	0	1	4
Benzoin	.	0	1	0
Citric	.	0	4	6
Sulphuric	.	0	0	1¼
Muriatic	.	0	14	0
Tartaric	.	0	1	5
Ammon. Carb.	.	2	16	0
Mur.	.	2	12	0
Ærugo Cris. Exot.	*6d.*	0	1	10
Argent. Vivum	*1d.*	0	3	11
Antim. Crude	.	1	6	0
Aloes, Barb.	*2s.*	*4s.6d.* a *6s.6d.*		
Socot.	,,	*4l.* a *12l.*		
Hepatic	,,	*4l.10s.* a *10l.*		
Bals. Capivi	*4s.*	0	1	10
Canada	*1d.*	0	0	11
Tolu	*2s.*	0	2	6
Peru	*1s.*	0	5	0
Camphor	.	0	5	10
Cantharides	*1s.*	0	5	0
Coccus	*1s.*	0	5	0
Colocynth	*2d.*	0	2	2
Cort. Cinchon. pale	*1d.*	*9d.* a *2s. 6d.*		
flav.	*1d.*	0	4	4
Cascarilla	*1d.*	2	10	0
Cream Tartar	*2s.*	3	8	0
Croci in fæno	*1s.*	0	19	0
Cubebs	*6d.*	5	0	0
Ess. Bergamot	*1s. 4d.*	0	11	6
Lemon	*1s. 4d.*	0	7	6
Fol. Senna Alex.	*6d.*	0	2	0
Tinny.	*6d.*	0	3	9
E. I.	.	0	0	9½
Galla Cærul.	*2s.*	4	2	0
Grains Parad.	*2s.*	13	0	0
Gum Ammon. gut.	*6s.*	0	2	6
Do. lump	*6s.*	0	1	0
Acacia, Turkey	,,	12	0	0
sorts	,,	*6l.* a *9l.*		
Ind.	,,	3	0	0
Benzoin	,,	*1s.* a *4s. 6d.*		
Fœtid.	,,	0	1	0
Guaiac.	,,	*1s.* a *2s. 6d.*		
Mastic	,,	0	3	9
Myrrh, Turkey	,,	13	0	0
Scammony	*2s. 6d.*	0	16	0
Do. Virgin	,,	1	4	6
Tragacanth	*6s.*	9	0	0

	Duty.	£	*s.*	*d.*
Liq. Sassafras	*2s.*	1	2	0
Manna, Flaky	*3d.*	0	3	0
Magnes. Carbon.	.	3	15	0
Calcin.	.	0	1	8
Musk, finest	*6d.*	4	0	0
common	.	1	10	0
Ol. Amygdal.	.	0	1	0
Essent.	.	2	0	0
Anisi	*1s. 4d*	0	7	4
Cajeput	,,	0	9	0
Cassia	,,	0	9	4
Cinnamon (oz.)	,,	0	9	0
Juniper	,,	0	3	2
Lavand.	*4s.*	0	9	0
Myrist. (oz.)	*1s. 4d.*	0	1	9
Origan.	,,	0	3	2
Rhodium (oz.)	,,	0	8	0
Ricini	*1s. 3d.*	*3½d.* to *8d.*		
Rosimar.	*1s. 4d.*	0	3	0
Opium, Turkey	*1s.*	0	11	0
Otto Roses	*1s. 4d.*	0	13	0
Rad. Anchusæ	*2s.*	1	3	0
Caryoph.	*4d.*	0	1	4
Colombo	*2s.*	2	10	0
Curcumæ	*2s. 4d.*	1	8	0
Gentian	*4d.*	1	8	0
Helleb. alb.	*1d.*	2	5	0
Jalap	*6d.*	0	2	4
Ipecac.	*1s.*	0	1	6
Rhæi Ind.	*1s.*	*5s.* a *9s.*		
,, Turkey	*1s.*	0	10	0
Sarsæ Hond.	*6d.*	0	2	2
,, Jam.	*6d.*	0	3	0
Serpent.	*2s.*	0	2	3
Sago, opt.	*1s.*	0	18	0
sec.	,,	0	12	0
Sal Acetos	.	0	1	8
Sang. Dracon.	*4s.*	2	16	0
Shellac, Liver	*6s.*	3	0	0
Orange	*6s.*	4	0	0
Sperm. Cæti	.	0	1	6
Soda Carb.	.	2	0	0
Tartar	.	3	15	0
Sulph. Quinine, F.	.	0	11	0
do. Ang.	.	0	10	0
Tamarinds	*1d.*	*40s.* a *85s.*		
Vitriol Cærul.	.	1	17	0

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THE CHEMIST.

I. CHEMISTRY.

REVIEW OF THE TRANSACTIONS OF 1839.*

BY M. VÉE.

The Chemical Sciences have not taken a higher flight in 1839 than in the year which preceded it, although a new metal, lantanium, has silently taken its place among the elements. These are become so numerous, that a new addition no longer causes sensation: it is a title whose lustre is dimmed, as every other, by multiplicity; and to which it is hoped some reformer will, sooner or later, do justice. Nothing, moreover, impedes such an event: the most eminent men, those who had given the most brilliant hopes, by studies stamped with a powerful spirit of generalisation, seem to be benumbed, when quite young in the enjoyment of academic chairs, or the honors of professorship; they seem more and more to resign themselves to the office of judges and analysts of the works of others, while they leave their laboratories to cool, and their pens to dry. Let us then welcome the new comers who have struggled in the lists which appear to be abandoned by the masters of the art. Pharmacy has furnished a principal part in recruiting the young chemists who are this year exhibited in the ranks. MM. Capitaine, Filhol and Huraut have taken the lead in serious works, which proclaim in them minds capable of rising to the highest deductions of science.

M. Robiquet cannot be classed among the academicians to whom a high position seems to suffice: we have had from him notices on the coloring matter of poligonum, on the milk of diseased cows, and a work relative to the action of heat on the citric and gallic acids, in which he has pursued complicated reactions in his usual clear and logical manner. M. Soubeiran, not contented with preparing a second edition of his excellent *Traité de Pharmacie*, has given useful practical instruction relative to the rectification of alcohol; he has continued to pursue the study he had commenced concerning the composition of soluble cream of tartar, and has arrived, in common with M. Capitaine, at some observations on tartaric acid, by which these chemists appear to have re-established in a most decided manner, a point of theory rather hazarded by the ingenious Liebig.

The decoloring compounds of chlorine, those Protei which seem to take a thousand different forms to escape examination, have again received from M. Millon a new and learned explanation. M. Bussy has discovered a curious chemical fact concerning the products of the combustion of coal pits. M. Payen has devoted himself to some remarkable works which have made known the nature of vegetable tissues insulated from all the products which they contain, or which are attached to them. M. Frémy has demonstrated some properties of organic membranes which are of a nature to throw great light upon the physiological act of digestion. M. Bouchardat has presented to the Academy the first results of experiments of high interest, to which he has again devoted himself, relative to the action of the simple bodies on the vegetable alkalies.

The study of the animal fluids has been pursued with ardour by MM. Lecanu, Denis, and Chevalier, who have given an account of extensive experiments on milk, blood, and urine; in this order of investigations must also be included the interesting memoir of MM. Cap and Henry on the lactates and state of urea in the urine of man. Whatever may be the opinion which physicians adopt definitively concerning the alteration of the fluids, whether as the cause, or as the effect of a pathological state, this alteration is but too manifest; and if chemistry succeed in finding vigorous and easy means to be put in practice to prove the nature of it, it will be able to throw powerful light upon the diagnostic of dis-

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[*] *Journal des Connaissances Médicales. No. 3.—Vol. I.—March.*

eases, and often to assure therapeutical applications.

This naturally leads as to speak of the investigations of M. Orfila, concerning the means of proving arsenic to be absorbed by the blood in cases of poisoning, of which the application of the ingenious process of Marsh has been the occasion. We have reported the first memoir of M. Orfila, and have stated how he arrived at finding in an entire subject some grains of arsenic. Since by an immense number of experiments, he has endeavoured to secure his process against all chance of error, and especially against those which might arise from arsenical matter proceeding accidentally from the vessels employed, or from the earth of the cemeteries, where he has shown that it has sometimes been found in the bones of men which contain it naturally, in the soft parts and viscera, which also perhaps yield it. The learned toxicologist has shown the clues which may serve to lead us out of this labyrinth; but how circumspect should such discoveries render those charged with pronouncing upon cases where the life of men is concerned in the decision.

The most brilliant fact of the year 1839 is due to a man who is neither a chemist nor a man of science, but an indefatigable investigator, endowed with that intelligent patience which has been said to be genius: it will be foreseen that we allude to M. Daguerre. His discovery, too much extolled before its publication, and certainly too much depreciated since, by some persons, is not less intrinsically a delightful result, which ought still to be elevated above all the labours to which it will serve as a starting point, and of which M. Daguerre will be considered as the father, notwithstanding all the endeavours which have been made to compare his process to the unformed attempts before him to sketch by means of light.

M. Daguerre, arriving without theory and as by a marvellous instinct at a process which he could not himself explain, and which at the moment made even men of science hesitate, evidently shows how, in the face of our chemical sciences, which sprung up but yesterday, our fathers, who never knew them, and those illiterate people who in our days cannot yet comprehend them, have been able to bring to the most astonishing perfection certain arts of industry, which seem to depend entirely upon these same sciences.

Pharmacy, properly so called, has given occasion also in the course of this year to some estimable works. The "Traité de Saccharotes Liquides" of M. Mouchon, the work of an enlightened and laborious practitioner, but conceived, perhaps, too much under the exclusive prejudice of the advantages which might be derived from new methods of lixiviation and displacing, has not the less served the progress of art, even by the discussions it has raised. We will say as much for the labors of M. Thierry on the clarification of mellites. A salt, known only to theoretical chemists, iodhydrargyrate of iodide of potassium, or double iodide of potassium and mercury, has been applied with advantage to medical use, by M. Puche, and its pharmaceutical forms pointed out by him. M. Bernard Derosne has published the use of a powerful astringent, derived from the vegetable kingdom, known at first by the name of monesia; the learned M. Guibourt has discovered its origin, and restored to it its Brazilian name of buranhem: the properties indicated by the books of the country have agreed, moreover, with those which had been recognized in it by the French physicians who have tried it.

It is also to M. Guibourt that we owe the best Memoir on Medical Natural History which has appeared during the year; it is evident that we allude to his beautiful and fruitful investigations concerning turpentine, a medicament produced so near us in nature, and with regard to which, however, the grossest errors were accredited; we must not be astonished after having known such a fact, if we have still so many things to learn concerning the substances which come to us from another hemisphere.

If, leaving France, we cast our eyes upon what has been done in foreign countries, we shall see the German Chemical School, still laboriously occupied in the progress of science. We have not found, it is true, any trace of the recent works of the illustrious Berzelius, but the names of Liebig, Rose, Wöhler, Winkler, Hare, Marchand, Döbereiner, Duck, Viggers, Fehling and several others, have been exhibited in our columns, and have proved the zeal of the Germanic nations for the study of Chemistry, which makes it the more remarkable, that less has been produced elsewhere. Italy has, it is true, learned physicians, societies and journals, which keep pace with the progress of science, but which have noticed few facts produced in that country. We have nothing to expect from Spain, too much torn by civil wars to know aught of studious leisure: but we are astonished at the silence of England, that classic land of intelligence and activity: the country of Priestley and of Davy, seems to slumber; and we have not seen, this year, in the numerous repertories we have looked over, any remarkable observation, to distinguish the labours of her sons.

In investigating the causes which have induced this penury, we find in the first rank the condition of Pharmacy in that country, where works of practical chemistry are perhaps followed with more ardour than any where else, but by manufacturers, who do not appear desirous of publishing the entire processes by which they operate. As for Pharmacy, such as is understood in France, and especially in Germany, we do not see a trace of it in England; which has its surgeon apothecaries, who aspire to the rank of medical doctors, and often attain it, and apothecary druggists who think more of the profitable concerns of a rich trade, than of barren theoretical speculations. We have hitherto vainly sought in London, a society or a journal especially consecrated to theoretical Pharmacy. We must not then be astonished, if in the long list of men and labours which for the most part have issued from our profession, and done honour to France and Germany, we have had the regret of being unable to quote this year any English name. Is not this fact a hint to our legislators concerning the directions to be given, in France, to the Pharmaceutical art?

PHENOMENA OF DIATHERMANCY.*

BY PROFESSOR FORBES.

Professor Forbes writes from Edinburgh on the 20th of December, to remark that he had published, prior to M. Melloni, a fact analogous to the discovery which the latter had communicated to the Academy in the sitting of the 7th of September last. This regards the discovery of a medium which transmits in greater abundance heat derived from a source at a lower temperature than that which arises, for example, from the flame of a lamp.

M. Melloni, says he, has an idea of blackening by smoke a plate of rock-salt, which is then found to be endowed with this property, which he rightly compares to the character of red glasses for light. But I have proved in a memoir published in May, 1838, that mica, reduced to excessively thin plates by the action of fire, possesses the faculty of transmitting in the smallest quantity the calorific rays transmitted by glass as the direct rays of the lamp. Consequently, mica, thus modified, enjoys a property contrary to that of glass, and of most known substances, even mica which has not been subjected to the action of fire. Since that time, I have tried other pieces which transmit twice as many rays from a source at a low temperature, absolutely deprived of light, as those of the lamp transmitted by ordinary glass. I have repeated the experiment of M. Melloni with success, and I find that these two substances, smoked rock-salt and exfoliated mica, have, in this respect, a complete analogy.

Wishing to investigate, continues Professor Forbes, what was, in the experiment of M. Melloni, the influence of the surface, I took a plate of rock-salt, I removed the polish by making rectangular striæ with fine sand, and I found that this plate, instead of transmitting 92 per cent. of any incident rays whatever, let pass 45 per cent. of rays of low temperature, and only 17 per cent. of luminous rays emerging from a plate of glass. A sheet of ordinary mica, which transmits a much greater proportion of luminous than of dark heat, being deprived of polish in the same manner, transmitted a much greater relative proportion of the second kind of heat.

This influence of the mechanical state of the surface of bodies cannot be attributed to the inequality of the reflection of these different kinds of heat; for, 1st, I have proved that heat arising from any source whatever is reflected on polished surfaces with an intensity entirely or very nearly equal; 2nd, these differences much surpass the quantity of heat reflected at perpendicular incidences; 3d, I have proved that striped surfaces reflect (at least for considerable incidences) a greater proportion of dark heat. It is consequently a stifling (*étouffant*) action of striped surfaces on incident heat (like the mutual destruction by the interference of luminous rays) which acts unequally on calorific fluxes of different origins. I have proved by direct experiments that heat receives a real modification during its transmission by unpolished rock-salt and exfoliated mica as well as by smoked salt. I find that the transmission of heat through one of these substances renders it more capable of traversing the others, or a second plate similar to the first.

In order to appreciate the effect of stripes on the diathermancy of rock-salt, the author striped a surface with the point of a diamond, in different manners. In all these cases the faculty of giving passage to the dark rays in preference to the luminous rays was so much the more marked as the surface was more striped. The power of an athermanous substance was introduced between two polished plates of rock-salt; dark heat was spread more easily than the other through this system. The tarnished surfaces of plates of rock-salt exposed for a long time to the action of air and humidity presented the same phenomena.

All these facts, resumes Professor Forbes, are sufficient proofs of the unequal influence of the mechanical condition of surfaces on the immediate transmission of the heat arising from different sources. The analogy which they present with some cases of interference in the theory of light is, he thinks, sufficiently striking eagerly to excite curiosity to ulterior investigations.

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* From *L'Institut*, No. 315, Jan. 9, 1840.

PROPERTIES OF HEAT.*

BY M. MELLONI.

M. Melloni transmitted from Naples, on the 9th of December, the results of a long series of observations which he has made on solar heat. In repeating the analysis of these rays by means of a prism of rock salt, he has proved that the maximum of temperature is not always at the same place in the dark space beyond the red limit of the spectrum, but sometimes nearer, sometimes further from the colours, and *that* in perfectly similar circumstances as to the force of the radiation, to the serenity of the sky and transparency of the air.

M. Melloni concludes from this, that the calorific rays deprived of light come to us in greater or less quantity according to the state of certain atmospheric constitutions which do not exercise any influence on the transmission of luminous rays. Now, it seems to me, he remarks, that there is a great analogy between this phenomenon and that observed by M. Daguerre relative to the diverse action of chemical radiations corresponding to equal heights of the sun above the horizon. In this latter case, it would be the dark part of this radiation situated beyond the violet limit which would undergo on its path a greater or less absorption, in virtue of a certain modification which would not alter the transparency of the atmosphere. It is true that, in this hypothesis, it must be admitted that the permeability of the air, for dark chemical rays, may differ, in certain cases, from its permeability for luminous rays. But have we not now a very great number of facts which prove that it is really thus with respect to optical, calorific, phosphogenic, and chemical effects produced by the same radiation?

DISENGAGEMENT OF CALORIC IN MULTIPLE PROPORTIONS.†

BY M. HESS.

Under this title, M. Hess read, on the 1st of March, a note in which he made known some experiments which took place under the observation of MM. Fuss and Jacobi, whose evidence is another guarantee of the accuracy of the facts declared. M. Hess took sulphuric acid at different degrees of hydration containing from 1 to 6 atoms of water for 1 atom of sulphuric acid, and observed the elevation of temperature arising from the mixture of this acid with an excess of water. In relating the quantities of heat disengaged by the same quantity of anhydrous acid, he found that the cyphers which expressed the relative quantities of disengaged heat were multiples, or nearly so. For example:

For 1 of anhydrous acid	found	calculated	multiples	differ.
$\dot{H}^6\dddot{S}$ disen. for	43 8	43·8	2	1
$\dot{H}^4\dddot{S}$	67·2	65·7	3	1
$\dot{H}^3\dddot{S}$	93·5	87·6	4	
$\dot{H}^2\dddot{S}$	132·6	131·4	6	2
$\dot{H}\,\dddot{S}$	225·5	217·8	10	4

We shall soon be convinced, says M. Hess, that these multiple proportions present a great analogy with the multiple proportions known for ponderable substances. In all cases, the quantities of heat disengaged prove to us that there exist more than three definite combinations between water and sulphuric acid. We know, on the one hand, that the first atom of water is found to be retained with more force than the second, the second with more force than all those which follow, and the cyphers which I have just presented prove to us that the more intimate the combination which is formed, the greater is the quantity of heat. That permits us to hope that the exact measure of the quantities of heat will give us the relative measure of affinity, and will lead us to the discovery of its laws. It is true that the case which I present is as yet the only one proved with sufficient accuracy; but I have already found several which approximate to it. I am employed in extending these experiments to several substances, and in investigating whether or not there exists a caloric equivalent which is met with in all combinations of analogous constitution.

CONGELATION.‡

BY M. CAGNIARD-LATOUR.

M. Cagniard-Latour communicated the result of an experiment on congelation which he had just made on a marteau of water, of small dimensions, namely, whose tube is only about 25 centimetres in length, and 8 millimetres in interior diameter, which had been exhausted of air with all possible accuracy. The principal object of this experiment was to know whether the water of the marteau, being solidified by cooling, would contain cavities, or gaseous bubbles, as is seen in ordinary ice. After the marteau of water had been prepared, care was taken, a moment before commencing the experiment of congelation, to keep it plunged by its inferior part in a water bath until the ebullitions of which the liquid column of the marteau had first become the seat had ceased to manifest itself, even while the top of the tube was kept wetted with cold water. This experiment of congelation has been repeated several times, and has always presented the same result, namely, that water of a like marteau always allows cavities or gaseous bubbles to be perceived when it is congealed. The author has seen as he had expected, according to the observations of M. Despretz, that the water of his marteau, although it was at 10° per cent. below zero, remained liquid, but he recognised that its passage to the solid state could be very easily determined, and that it suffices for this effect, to strike with sufficient force the lower part of the tube upon a hard body, as, for instance, a marble table.

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* *L'Institut*, No. 315, Jan. 9, 1840.

† *Ibid.* No. 318, Jan. 30, 1840.

‡ *L'Institut*, No. 318, Jan. 30, 1840.

ON THE LAW OF SUBSTITUTIONS AND THE THEORY OF TYPES.*

BY M. DUMAS.

This memoir is a reply to the criticisms which have been made, especially by M. Berzelius, on the theory of substitutions and other theoretical views set forth by M. Dumas. Having given in our columns the text of a memoir of M. Berzelius, the publication of which has perhaps contributed to hasten the publication of this memoir by M. Dumas, we for the present content ourselves with enumerating the series of questions which M. Dumas treats in it. These questions are the following. To express them, we make use of the very words of the author.

1st. In every combination, may elements be replaced, equivalent for equivalent, by simple bodies or by bodies which act as such ?

2nd. Are not these substitutions often effected without the general nature of the compound being altered ? bodies thus produced belong then to the same chemical type as those from which they are derived.

3rd. In other cases, may these substitutions furnish products entirely distinct, by their reactions, from those which have given rise to them, and is it, nevertheless, expedient to consider them as belonging to the same molecular type ?

4th. May not the nomenclature of organic substances, from this time forward, be perfected in such a way that the name of each body may express the chemical or even the molecular type to which it belongs ?

5th. Do the phenomena of substitution oblige us to modify profoundly the value attached, until latterly, to organic radicals ?

6th. Is not the electrical action attributed to the elements of compounds by the electro-chemical theory a complete contradiction of the phenomena of substitutions ?

PREPARATION OF OXY-HYDROGEN GAS.†

BY MM. HESS AND JACOBI.

MM. Hess and Jacobi occupied the Academy, in the sitting of the 22nd February, with experiments which they had made with the view of facilitating the preparation and employment of oxy-hydrogen gas. The employment of expensive gasometers, the danger more or less great, which is the consequence of it, the difficulty of preparing a considerable quantity of oxygen, have hitherto prevented the use which might have been made, whether for lighting, or for the fusion of very refractory substances, of the mixture of the two gases, oxygen and hydrogen. MM. Hess and Jacobi have found that the use of voltaic apparatus might much diminish these difficulties. The experiments which they have made have shown them that a voltaic battery of 10 square feet of zinc is sufficient to produce, by the decomposition of the water, 1 cubic foot of the detonating mixture per hour. Now, a Drummond lamp, such as has been tried for light-houses, and possessing an illuminating power of 123 wax lights of 1¾ inches in diameter, consumes 6 cubic feet of gas per hour. To produce this effect then during a given time, such a battery of 60 square feet of zinc would be sufficient, as, by superposing, the apparatus might be contained in a space of 4⅓ feet square by 4 feet in height. For ordinary lamps, which are far from requiring so great an intensity of light, such an apparatus would find without difficulty the necessary room. The advantage of these apparatus is considerable. Thus one person is sufficient to ascend and charge them in the space of three quarters of an hour; they do not require any preparation, and render the provisions of gas useless, inasmuch as it is consumed as it is produced; the disengagement of the gas is perfectly uniform, as MM. Hess and Jacobi have ascertained. MM. Hess and Jacobi propose to give this gas the name of *electrolytic gas*, on account of the source from which it is obtained.

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* *L'Institut*, No. 319, Feb. 6, 1840.

† *L'Institut*, No. 318, Jan. 30, 1840.

ACTION OF ALCOHOL ON THE ALKALIES.*

BY MM. DUMAS AND STASS.

M. Dumas read, in his name and that of M. Stass, the following note relative to the action of the alcohols on the alkalies.

We have observed, he said, by precise experiments, the following results:—1st, Pure alcohol, $C^8 H^{12} O^2$, is converted, under the influence of hydrate of potassa and heat, into pure hydrogen, and equally pure acetic acid, $C^8 H^8 O^4$; 2nd, Pyroligneous acid, $C^4 H^8 O^2$, under the same circumstances, furnishes formic acid $C^4 H^4 O^4$, and pure hydrogen; 3rd, Ethal $C^{64} H^{68} O^2$, by the same reaction, is converted into a new acid, ethalic acid, $C^{64} H^{64} O^4$, and disengages pure hydrogen like the two preceding bodies; 4th, Potato oil, $C^{20} H^{24} O^2$, treated in the same manner, furnishes hydrogen, giving rise to a volatile liquid and oleaginous acid $C^{20} H^{20} O^4$. Theory indicated that this acid would have the same composition as the acid which is furnished by valerian, and which is called valerianic. Experiment has given us an acid which affords exactly its composition $C^{20} H^{20} O^4$, which presents all its properties and even its smell, and which makes, like it, salts with a sweet taste. It appears to us almost certain that by means of this action of hydrate of potassa, we are able to transform potato oil into an acid which seemed very dissimilar to it, the valerianic.

What clearly results from the four preceding experiments, is, that every alcohol is converted, under the influence of the hydrated alkalies, into an acid which corresponds with it, and that it is done always by losing four volumes of hydrogen and gaining two volumes of oxygen, conformably to the theory of types and the law of substitutions.

Glycerine has also furnished us pure hydrogen by the action of potassa, but we have not yet been able to separate the acid which resulted from the reaction, and which appears capable of furnishing secondary products with the greatest facility.

We have found in the preceding results the means of explaining the action of alcohol upon anhydrous baryta, an action of which we have ascertained the results by certain experiments which constitute in some sort a method of qualitative analysis applicable to mixtures of carburetted gases.

When a current of pure alcohol was directed on anhydrous and heated baryta, there was developed in our experiments three gases at least, and perhaps four. The first consisted of olefiant gas, which Nordhausen sulphuric acid absorbs, and which chlorine changes into Dutch liquor. We are convinced of this by analysis of the latter. The second consists in gas of marshes which remains after the olefiant gas has disappeared, and which may be converted by means of chlorine into chloride of carbon $C^4 Ch^8$, which corresponds to it. We have performed the analysis of this chloride of carbon. The third is hydrogen, which was indicated by eudiometrical analysis. The fourth would be oxide of carbon.

The first three gases, whose existence is incontestible in the mixture which we obtained, seemed to be derived from the following actions:—

1st, Anhydrous baryta in acting on alcohol would give hydrate of baryta and olefiant gas; 2nd, The hydrate of baryta thus formed would produce, with a new portion of alcohol, hydrogen and acetate of baryta; 3rd, The acetate of baryta in presence of an excess of base would furnish gas of marshes and carbonate of baryta.

Thus the action of anhydrous baryta on pure alcohol yielded us three distinct gases, resulting from three reactions probably distinct also. We have not been able to seize in any manner the conditions in which MM. Pelouze and Millon are placed, who have declared, as is known, that anhydrous alcohol and baryta furnish: 1st, carbonate of baryta; 2nd, A gas furnishing its volume of carbonic acid, absorbing twice its volume of oxygen, in a word, endowed with the same composition as the gas of marshes.

It is known that MM. Pelouse and Millon have announced moreover that this gas is isomeric with the gas of marshes, that is to say, that it has its composition without its properties, and that its production as well as its conversion by bromine into hydrocarburet of bromine, are so many facts incompatible with the theory of types. Without pretending in any way to invalidate the experiments of MM. Pelouze and Millon, concerning which we expect the details which will permit them to be repeated with success, we can then declare here that according to our own investigations: 1st, The action of alcohols on the hydrated alkalies is shown to be very simple, and perfectly conformable with this theory, for every alcohol loses by substitution 4 vol. of hydrogen, gains 2 vol. of oxygen, and produces an acid which corresponds to it, an acid of the same type; 2nd, The action of alcohol on anhydrous baryta is, on the contrary, a very complex action which gives rise to mixtures of carbonate and hydrate of baryta in the residue, to a mixture of olefiant gas, gas of marshes, hydrogen, and probably oxide of carbon in the gaseous products. According to MM. Pelouze and Millon, there would be made in this last case pure carbonate of baryta, and a homogeneous gas endowed with extraordinary properties. We have not been able to place ourselves in favourable conditions to find the results they have announced.

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* *Comptes Rendus*, No. 7, Feb. 1840.

After this lecture M. Pelouze replied, and maintained the accuracy of his experiments, which he has repeated quite recently. If M. Dumas has not obtained the same results, it is doubtless because he is placed in circumstances of temperature and others, different from those in which M. Millon and himself had operated.

ACTION OF CHLORINE ON THE CARBURETTED HYDROGEN OF THE ACETATES.*

BY M. DUMAS.

A note by M. Dumas was communicated, under this title, of which we now give the greater part.

Acetic acid treated by chlorine gives rise to chloracetic acid: the latter, under the influence of the alkalies, is converted into carbonic acid and chloroform. If there exists an analogy of type, as I have announced, between acetic and chloracetic acid, the first should give, with alkalies, a carburetted hydrogen $C^4 H^8$, corresponding to chloroform $C^4 H^2 Ch^6$. The production of this carburet, under the influence of the alkalies, is not proved; but if the carburet $C^4 H^8$, produced by acetates corresponds to chloroform $C^4 H^2 Ch^6$, it should give rise, by means of chlorine, to the following series:

$C^4 H^6 Ch^2$ hydrochlorate of methylene.
$C^4 H^4 Ch^4$ id. chlorated.
$C^4 H^2 Ch^6$ chloroform.
$C^4 Ch^8$ chloride of carbon.

I have made many experiments to put in evidence the production of these different bodies.—Here follow the details of the experiments, from which M. Dumas draws the conclusion, that the gas of the acetates acts under the influence of chlorine as the law of substitutions and the theory of types indicated beforehand, since the body $C^4 H^8$ is changed into $C^4 Ch^8$. To be sure, adds he, this conclusion concerns only the gas of the acetates; for I have not made any experiment upon the gas of marshes, properly so called, and I have not occupied myself much with the gas of alcohol, which might be but a simple mixture. I maintain, then, purely and simply, my preceding conclusions. Acetic acid and chloracetic acid belong to the same type; it is the same with chloroform and the carburetted hydrogen gas of the acetates; for acetic acid produces the carburetted gas under the same circumstances as those in which chloracetic acid yields chloroform; and chloroform, as well as the carburetted gas of the acetates, are both transformed by the action of chlorine into a chloride of carbon $C^4 Ch^8$ which belongs to the same type as them.

At the conclusion of the communication of the note of M. Dumas, M. Pelouze said that in submitting to the action of bromine, the proto-carburetted hydrogen gas arising from the decomposition of alcohol by baryta, he had obtained, in concert with M. Millon, hydro-carburet of bromine corresponding to the liquor of the Dutch; that this combination, perfectly identical with that which is obtained with olefiant gas, appeared to him impossible to be explained according to the law of substitutions of M. Dumas. He adds that he thinks that this law, when it is shown, is only a peculiar case of chemical equivalents; and that he has undertaken, with M. Millon, experiments with the view of confirming his opinion in this respect.

CONTRIBUTIONS TO THE HISTORY OF TARTARIC ACID.†

BY MM. SOUBEIRAN AND CAPITAINE.

MM. Dumas and Liebig have observed that tartar emetic loses, by heat, two equivalents of water more than other tartrates. This observation having conducted them to particular considerations concerning the composition of tartaric acid, it became interesting to enquire whether the tartrates which have an elementary composition analogous to that of emetic did not possess the same property, which is what we propose to do in this memoir.

The ferro-tartrate of potassa which was first examined with this view, did not yield to experiment; heated to a temperature which did not exceed 130°, it allowed water and carbonic acid to be disengaged at the same time, and the oxide of iron was partly reduced.

This easy reduction of ferro-tartrate of potassa explains why, in drying it, a mass almost insoluble in water is often alone obtained; it explains, also, why a chemist, Phillips, has found but half an atom of iron in the salt; it is because it is decomposed even at the temperature of boiling water. MM. Soubeiran and Capitaine recommend it to be prepared by digesting cream of tartar and hydrated peroxide of iron in water at a temperature not exceeding 60°; thus is obtained a perfectly saturated solution, which is evaporated in plates upon a stove; the salt is then presented under the form of transparent scales of a reddish brown; it contains one equivalent of iron.

The boraxated tartrate of potassa (soluble cream of tartar) should yield to experiment better by reason of the difficult reduction of the borax; the serious difficulty which is here presented in obtaining this salt which is uncrystallizable, in the state of perfectly definite proportions. M. Soubeiran procured from it, by precipitating with alcohol, a concentrated solution of soluble cream of tartar; he heated the molasseous matter which was precipitated from it, and submitted it two or three times to the same operation.

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* *L'Institut*, No. 318, Jan. 30, 1840.

† *Journal des Connaissances Médicales*, January, 1840.

Soluble cream of tartar perfectly dried at a temperature of 100° can afterwards sustain a heat of 285° centigrade without changing character; but it has constantly lost a proportion of water equivalent to two atoms, which perfectly assimilates it to emetic.

This loss of water could not be reconciled with the admitted elementary composition of tartaric acid, which is $C^8 H^8 O^{10}$.

M. Liebig thinks that part of the base of the salt is reduced, and that its oxygen is united to the hydrogen taken from the acid to form the two atoms of water; thus, he regards as experimentally proved, what had sometimes been admitted by a simple hypothesis, the presence of unoxidized metallic bases in salts.

MM. Soubeiran and Capitaine do not partake this opinion; they remark that if, on one hand, by heating emetic to the point at which the acid is destroyed, part of the antimony is found in the metallic state; on the other, by heating in the same manner soluble cream of tartar, the borax is not found to be in the least reduced. MM. Soubeiran and Capitaine prefer to admit that the two atoms of water were quite formed and united, in the state of base, to the tartaric acid, whose true formula would then be $C^8 H^4 O^8$. This acid would always be united to at least four equivalents of base, whether water or oxide; but in salts with excess of base, the two atoms of water might be driven away without the properties of the salt being destroyed, because the excess of base would just complete the four equivalents indispensable to its constitution; as it is only with these salts that the above-mentioned experiment can succeed.

ON SEVERAL NITRITES AND CHLORIDES OF ANTHRACENE.*

BY M. LAURENT.

By boiling anthracene with nitric acid, four different compounds are obtained, which have much analogy between themselves and with different compounds which I have already made known under the names of nitrites of naphthalase, naphthalese, chrysenase, pyrenase, &c.

These four compounds are more or less soluble in ether: it is with the assistance of this solvent that they may be separated from one another. They are crystallizable; their most prominent character consists in the property which they possess of entering into ignition when they are heated in a close vessel.

When they are slowly heated, they allow a crystalline matter to sublime, which I made known some years ago under the name of paranaphthaline.

Chlorine and naphthaline give a compound in which two equivalents of hydrogen are replaced by two equivalents of chlorine.

The following is a table of the composition of these bodies; the second term is not known.

	Anthracene .	. $C^{60} H^{24}$.
Products of the action of nitric acid.	Nitrite of anthracenase	. $C^{60} H^{22} O + A^2 O^2$.
	Binitrite of anthracenese	. $C^{60} H^{20} O^2 + 2 Az^2 O^3$.
	Trinitrite of anthracenese	. $C^{60} H^{18} O^3 + 3 Az^2 O^3 + 3 H^2 O$.
	Nitrite of anthracenise	. $C^{60} H^{18} O^3 + A^2 O^3$.
	Nitrite of anthracenose	. $C^{60} H^{16} O^4 + A^2 O^3 + H^2 O$.
Product of the decomposition of the preceding.	Anthracenuse .	. $C^{60} H^{14} O^5$.
	Chloranthracenise .	. $C^{60} H^{20} O^4$.

* *Comptes Rendus*, No. 4, Jan. 27, 1840.

SEA SALT CONTAINING IODIDE OF POTASSIUM.†

BY M. A. BOUCHARDAT.

Several political journals have called public attention to a fact which is more important than they have announced.

Some years since, the saltpetre makers employed in the manufacture of the sodas of Wareck, and obtained as a secondary product, sea salt, which they sell in commerce without paying the duty; the treasury and municipal customs found themselves thus defrauded of considerable sums. It is an evil, without doubt, but society would experience a much greater injury, which is that the salt sold in commerce contains a very considerable proportion of iodide of sodium and that public health may suffer thereby; this fact has been proved to the central pharmacy, and since that time, the administration of hospitals has ordered the salt to be analysed which is received into its establishments. Several provisions have already been refused. To prove the presence of the iodide, it is sufficient to put 10 grammes of the suspected salt into a flask of the capacity of 200 grammes, to pour into it an excess of sulphuric acid, placing in its neck a piece of paper steeped in the jelly of starch, it immediately turns blue if the salt contain a notable quantity of iodine.

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† *Journal des Connaissances Médicales*, January, 1840.

NEW PHOTOGENIC PAPER, INTO THE COMPOSITION OF WHICH THERE ENTERS NO SALT OF SILVER.*

BY M. MUNGO PONTON.

The paper which M. Ponton proposes has the same inconveniences as that which attaches to the process of Mr. Talbot, namely, of giving shade to the light parts, and *vice versâ;* but it has an advantage over the latter of being more economical and more easily employed. We shall continue to notice all the modifications which may be made in photogenic processes, however slight they may be, in the idea that the knowledge of the different circumstances in which light may act upon bodies is of a nature to furnish natural philosophers and chemists with results of chemical and optical interest. The following are some details concerning the process of M. Ponton.

M. Ponton tried to prepare photogenic paper with chromate of silver; and with this view he first employed neutral chromate of potassa, afterwards the bichromate of the same base, and he perceived that when paper was steeped in a solution of bichromate of potassa alone, it experienced a rapid and energetic influence from the action of the solar rays. In consequence, he had an idea of making use of this paper to obtain drawings, without knowing in what manner he should preserve them upon it. The event exceeded his expectation. In exposing an engraving, for example, in the ordinary manner upon this paper, the part exposed to the light rapidly becomes of a fawn colour, passing more or less to a bright orange, according to the strength of the solution and the intensity of the light. The black portion retains the original colour of a bright yellow, so that the object is thus represented in yellow upon an orange ground, with gradations of tints or shades according to the greater or less degree of clearness of the details. In this state the drawing, although very fine, cannot be kept a day. To fix it, all that is to be done is to plunge it carefully into water, and it is found that the portions of the salt which have not been exposed to the action of light are dissolved with facility, while those which have experienced it remain fixed and unalterable upon the paper. We have then a white drawing upon an orange ground, and that completely stable. Exposed for several hours to the sun, the colour of the ground loses its tint, but not more than most colouring matters.

The action of light on a bichromate of potassa differs from that which it exercises on the salts of silver. Such of the latter as are not blackened by the solar rays, are by themselves insoluble in water, so that it is difficult to impregnate the paper with it in a very equal manner. The black colouring seems the result of the formation of oxide of silver. With bichromate of potassa, a very soluble salt, nothing is so easy as to saturate the paper completely with its solution. The action of light changes the colour of the salt, and takes from it at the same time its solubility in water. This effect appears to the author to be owing to the liberation of the chromic acid, which is of a deep red colour, and which seems to combine with the paper. This explanation is rendered very probable by the fact, that the neutral chromate does not present, under the same circumstances, any apparent alteration. It is especially in the violet rays of the spectrum that in this case chemical action resides, as it is, moreover, with salts of silver. To demonstrate it, the author filled three flattened flasks, one with an ammoniacal solution of copper transmitting violet rays, another with a solution of bichromate of potassa allowing yellow rays to pass, and the last with a tincture of iodine giving red rays. The paper was rapidly coloured by the rays transmitted by the first, but not at all by the two others, although the intensity of the light which traversed the solution of bichromate of potassa was much more considerable than that which the ammoniacal copper allowed to pass.

The best method of preparing this photogenic paper consists in employing a saturated solution of bichromate of potassa, and in well impregnating the paper and drying it rapidly before a good fire, carefully excluding daylight. Paper, thus prepared, acquires in the sun a very bright orange tint. If the solution is weaker, or even the desiccation less rapid, the colour will be less deep. A different and agreeable tint may be obtained by mixing sulphate of indigo with the bichromate of potassa; the colour of the object and that of the paper are in this case of different shades of green. The object is, then, of a deeper tint than the ground. Paper, impregnated with bichromate of potassa, is as sensible as most papers prepared by the salts of silver, although it is inferior to some of them. It is not sensible for the figures of the camera obscura, but it is excellent for copying dried plants, engravings, &c. Its great superiority is in its cheapness, and the facility of its preparation. A pound of bichromate of potassa costs only three francs—the price of half an ounce of nitrate of silver. The preparation of salts of silver requires nice and delicate precautions, while the preservation of the paper of bichromate of potassa, and the fixation of the images, are so simple, that it cannot be doubted that they may usefully be turned to profit by lithography itself.

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* *L'Institut*, No. 316, Jan. 16, 1840.

ON THE DECOMPOSITION OF ORGANIC SUBSTANCES BY BARYTA.*

BY MM. PELOUZE AND MILLON.

In treating acetic acid by chlorine, M. Dumas has made the discovery of a new acid which he has named chloracetic; he has observed that this acid, under the influence of alkaline bases, is transformed into carbonic acid and chloroform, and he has thought to be able to assimilate immediately this latter transformation with that which, in the same circumstances, acetic acid undergoes. Thus acetic acid, $C^4\,H^6\,O^3$, $H^2\,O$, and chloracetic acid $C^4\,CL^6\,O^3$, $H^2\,O$ giving with the alkalies, the first, gas of marshes $C^2\,H^8$, the second, chloroform, $C^2\,CL^6\,H^2$, the gas of marshes and the chloroform belonged to the same organic type, and would be as near to one another as the acids from which they are derived.

The production of the gas of marshes takes place under many circumstances; but in none has it been shown in so clear and curious a manner, as in the experiment of M. Dumas. However, the same experiment, the same results were noticed by M. Persoz, in a work entitled: *Introduction à l'étude de la Chimie moléculaire.* This chemist expressly says that in decomposing the acetic acid in acetate of potassa, by 1 equivalent of hydrate of potassa, 2 equivalents of carbonate of potassa are obtained and 4 volumes of the gas of marshes, $C^2\,H^8$ which he names, on account of its composition, tetrahydroguret of carbon. M. Persoz, although actuated by theoretical ideas which differ from those of M. Dumas, equally sees the preservation of type.

It seems to us that the production of the gas of marshes did not offer any connection with the constitution of acetic acid: that there was there a phenomenon of the same order as those which were remarked by one of us, some years ago, in the decomposition of formic acid by potassa, of the same order as the phenomena observed by M. Mitscherlich, by M. Peligot in the decomposing action of lime upon benzoic acid, and by M. Bussy, when noticing margarone and paraffine.

In a word, we have found a true decomposition, a destruction of the substance, and it is in this point of view that we have devoted ourselves to some investigations.

Absolute alcohol has such a composition that it may be transformed into carbonic acid and gas of marshes, $C^4\,H^{12}\,O^3 = CO^2 + C^3\,H^{12}$; we have made it pass over anhydrous baryta, at a temperature approaching a dull red, and we have completely transformed it into carbonic acid, which remains upon the baryta, and into gas of marshes which is disengaged in abundance.

There is, then, a new source of gas of marshes in alcohol, and surely, no one will be able to see even a distant relation between these bodies. Is there a greater relation between acetic acid and gas of marshes?

Formic acid $C^2\,H^2\,O^3$, $H^2\,O$, may be represented by $C^2\,O^4$, H^4, that is to say, by carbonic acid and pure hydrogen: when heated with an oxide, it is indeed decomposed into carbonic acid which remains upon the oxide, and into pure hydrogen†. In this circumstance, half of the hydrogen comes from the water, which has been decomposed by the carbon of the formic acid, under the influence of potassa. This mode of decomposition, already more advanced than that by anhydrous baryta, has caused us to expect an analogous destruction for alcohol, by employing hydrate of baryta. We then made the gas of marshes proceeding from the decomposition of the alcohol pass over hydrate of baryta, and obtained hydrogen in great quantity.

Naphthaline is burnt in the same manner, giving rise to a disengagement of hydrogen.

The anhydrous oxalates heated with baryta give, as we know, oxide of carbon: by substituting hydrate of baryta, we obtained hydrogen.

We were thus led to decompose oxide of carbon itself by hydrate of baryta: it yielded us pure hydrogen.

Lastly, carbon heated with an excess of hydrate of baryta, passed to the state of carbonic acid which combined with the base, while hydrogen was again disengaged.

In setting out upon the preceding experiments, we expected to be able to draw the following very simple conclusion: anhydrous baryta removes from organic substances all the carbonic acid which their elementary composition permits them to furnish; hydrate of baryta pushes the destruction farther, and tends to consume all the carbon, while the hydrogen which arises from the substance is combined with that which proceeds from the decomposition of the water and is in a state of freedom. It is understood that by virtue of this rule those isomeric substances which differ in their intimate composition, should all arrive at the same final destruction.

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* *Comptes Rendus*, No. 2, January, 1840.

† *Ann. de Ch. et de Phys.*, 1831, vol. xlviii. p. 398.

In the products which result from this violent reaction, there is not, according to us, any other relation with the primitive substance than that which is immediately derived from the same composition as the latter. Its molecular *arrangement* and its type are annihilated. We cannot better compare this action of baryta than with that of copper on organic substances. With the oxide of copper, the carbonic acid which is produced at the expence of the organic matter is disengaged and the copper remains; with baryta, the carbonic acid remains combined. The only difference arises from this, that the oxide of copper is of easy reduction, and consumes hydrogen as well as carbon, while baryta is not reduced in any case; let us add that it is the water alone of the baryta which furnishes its oxygen to combustion, and that hence hydrogen should be disengaged in a free state.

Remarks of M. Dumas on the occasion of this Memoir.

I regret having been unable to be present at the commencement of the sitting, for it was my intention to entertain the academy with the experiments published by M. Persoz, touching the decomposition of the acetates by means of the alkalies, and their conversion into carbonates and gas of marshes. I had foreseen this conversion in my Memoir on Chloracetic acid, but have only been able to realise it latterly. In the interval, the work of M. Persoz has appeared: it contains the same fact, of which I have had information by a letter from M. Persoz himself, which I received yesterday, and I hasten to render to the learned professor of Strasburg that which belongs to him.

As for the rest, in pursuing my experiments I have been for some days persuaded that alcohol yields, by the action of baryta, gas of marshes; that formic acid gives pure hydrogen; that it is the same with oxalic acid.

These facts I had foreseen; they agree with that which M. Pelouze has just related, as might be expected. They are discussed in the memoir which I am occupied in completing, and are applied to views perfectly in accordance with those which have actuated the investigations which preceded these.

ADDITION TO THE NOTE ON THE DECOMPOSITION OF ORGANIC SUBSTANCES BY BARYTA.*

BY MM. MILLON AND PELOUZE.

In announcing at the last sitting the formation of protocarburetted hydrogen by the decomposition of alcohol by the aid of baryta, we were bound to prove the composition of this gas, and the condensation of its elements. They are perfectly identical with the composition and condensation of the gas of marshes. Each volume of these two elastic fluids has for formula $C\,\frac{1}{2}\,H^2$, for both require, in order to burn, twice their volume of oxygen, and produce their own volume of carbonic acid.

The very little known properties of the gas of marshes, and especially the frequent cases of isomeria among the carburets of hydrogen, have induced us to pursue comparatively our investigations concerning the two preceding gases and that extracted from acetic acid.

We have remarked, in the action of bromine on the gas of stagnant water, and on that of alcohol, a great difference; the first is attacked very difficultly in diffused light, while the second is decomposed, under the same circumstances, with an extreme energy.

There has also seemed to us to be a perceptible difference, although less decided, between the gas of marshes and that extracted from acetic acid, so that there would be three gases composed and condensed in the same manner, but presenting different properties, or, in other terms, *three isomeric bodies.*

The action of bromine on the protocarburetted hydrogen of alcohol, gives rise to an etherial liquid whose composition is very far from what it ought to be, admitting the theory of substitutions of M. Dumas.

We have already interpreted in a manner entirely opposed to M. Dumas the resemblance which he had established between two reactions, one on acetic acid, the other on chloracetic acid. We add that we have arrived, to interpret these reactions, at conclusions which might be deduced not only from the experiments which we have reported in our Note, but also from the experiments of former chemists, when they burned carbon with hydrate of potassa; from those of M. Chevruel, when he obtained pure hydrogen by the action of the alkalies on ligneous bodies; from those of M. Gay Lussac, when he destroyed several organic substances by potassa; and, lastly, from the experiments of which M. Persoz has given a recapitulation in his *Introduction à l'étude de la Chimie moléculaire*. Remarking that all organic matters were decomposed by a great excess of hydrate of potassa, giving birth to pure hydrogen, M. Persoz has pointed out this means as susceptible of being applied to elementary analysis.

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* *Comptes Rendus*, No. 3, January 1840.

Finally, Drs. Austin and Higgins observed about half a century ago, the formation of gas of marshes, or at any rate of a gas isomeric with it, in distilling ascetate of potassa.

ON THE ESSENCE OF TURPENTINE AND ARTIFICIAL CAMPHOR.*

BY MM. SOUBEIRAN AND CAPITAINE.

MM. Soubeiran and Capitaine presented essays on essence of turpentine and artificial camphor. "It has been long known that essence of turpentine furnishes with hydrochloric acid a solid compound called artificial camphor. But this subject had not been sufficiently studied. These are the results obtained by MM. Soubeiran and Capitaine:—

"1st. Hydrochloric acid, in acting upon the essence of turpentine, furnishes two different compounds: one is the ordinary artificial camphor; the essence which is found in it (the camphene of M. Dumas) has retained its primitive rotatory power; the other combination is liquid. It contains a portion of essence which has experienced, under the influence of the acid, a modification which has left its chemical composition and capacity of saturation, but which has deprived it of the property of giving a solid camphor. This modified essence, which will be called *peucylene*, possesses, in liquid camphor, a weaker rotatory power, than that of the volatile oil of turpentine.

"2nd. When the solid camphor of turpentine is decomposed by lime, a peculiar oil is extracted from it, which M. Dumas considered as the essence of the turpentine itself. The name of *terebene* has been given to it. This terebene has the same density in the liquid state, and state of vapour, as essence of turpentine; its point of ebullition is the same. It is formed from the same elements, carbon and hydrogen united in the same proportion; but terebene is no longer essence of turpentine: it has no more rotatory powers. This terebene combines with hydrochloric acid and reproduces a solid camphor, which might be taken, from its characters and chemical composition, for camphor of turpentine; but, what is remarkable, this camphor has not the power of deviating the rays of polarised light.

"3rd. Liquid camphor of turpentine, or hydrochlorate of peucylene, has the same chemical composition as solid camphor. From it may be extracted, by means of lime, a kind of volatile oil, which presents the greatest analogy of characters with terebene and with essence of turpentine. This new oil, which will be designated by the name of *terebilene*, has an identity with terebene which is only deficient in a single point: terebilene does not yield solid camphor. It differs from essence of turpentine by its smell, and because it has no power of rotation.

"4th. Camphene, terebene, peucylene and terebilene, present to us the remarkable series of four chemically isomeric bodies, formed from the same elements, united in the same ponderal proportion, having a common capacity of saturation, a similar atomic weight, and which, however, have each a peculiar molecular state. It is perhaps the most remarkable case of isomeria which the science yet possesses, for to the chemist terebene is absolutely the same body as camphene; he finds the same identity between peucylene and terebilene. Chemistry is unable to distinguish them. However, in these bodies, the interior constitution of the particle is not the same; since they have not the same action on polarized light. Who can tell in what the difference consists?"

After the reading of this communication, M. Biot added that MM. Soubeiran and Capitaine had been kind enough to make him a witness of almost all the results which they had just announced, and that he had thus been able to convince himself of their accuracy. He accompanied this declaration by the following remarks:—

"Seeing the number of isomeric bodies daily augment, we are led to inquire whether chemical analysis might not omit some of the elements necessary to the molecular constitution of bodies. If such an omission exist, the extreme precision of the processes of weighing now employed must necessarily limit it to some principle of a density sufficiently weak to escape our balances. Now, as the principle of heat intervenes with great power in the composition and decomposition of bodies formed of dissimilar matters; it becomes natural to examine by experiment whether there be not left in isomeric substances some trace of its presence and its action, which would be dissimilar; in as much as a crowd of physical considerations tend to make us believe that this principle is indeed an essential and important element of material bodies.

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* *Journal de Chimie Médicale, Jan.* 1840.

"The first trial to be made to arrive at this conclusion, that which seems to present itself before every other, would consist in measuring comparatively, with much care, the specific heats of isomeric substances, to ascertain whether they are equal or unequal in every given case of isomeric. The result of this trial, be it what it might, would be profitable to science; for equality of specific heats would add still a new character of identity very intimate with that which these substances already present, and their inequality would at least reveal a dissimilarity of action in one of the most active principles of their formation. Not having either the means or the forces necessary to carry on such a work, M. Biot thought he might be able with some utility to point out the important consequences which might arise from it, and to urge its accomplishment."

M. Dumas replied, and remarked on this occasion, that to his personal knowledge, the question raised by M. Biot had already been made the subject of a great number of experiments on the part of M. Regnault, one of the most commendable of our young chemists, as well for the depth of his views as for the precision of his experiments. This remark, the object of which was favourable to him, was supported by M. Arago, Gay Lussac, Thenard, Elie de Beaumont, who, like M. Dumas, knew of the operations of M. Regnault.

INVESTIGATIONS CONCERNING THE CAMPHOR OF TURPENTINE.*

BY M. DEVILLE.

M. Dumas read, in the name of M. Deville, a note on the essence of turpentine.

The author finds that essence of turpentine furnishes two evils which have the same chemical composition, the same density in the liquid state and in the state of vapour, as well as the same point of ebullition. They have both the same affinity for, and combine with hydro-chloric acid, but their combinations are not equally stable, the one of them, which furnishes the solid compound known by the name of artificial camphor, is more difficult to be separated from the acid than the other, which produces with hydrochloric acid a liquid compound.

M. Deville has remarked that the essence of raw turpentine, treated by hydrochloric acid, furnished the two combinations which have just been noticed, as everybody knows; but he adds that, when the uncrystallized portion is separated from the first crystals obtained, and exposed to the air, new crystals are formed, and that by repeating this experiment several times, nearly the whole of the essence is converted into crystallized artificial camphor.

The author having treated essence of turpentine by sulphuric acid and peroxide of manganese, ascertained that the greater part of the essence was transformed into non-volatile products; but an oil was volatilized, and it was precisely the oil which produces a liquid camphor, as the author had foreseen.

In treating essence of turpentine by chlorine, the author procured a compound whose formula was $C^{40} H^{24} \underline{Ch}^{8}$, conformably to the theory of substitution. By treating in the same manner the portion of the essence which makes a liquid camphor, a body is obtained isomeric with the preceding, and less stable than it.

The author has also studied the action of heat on the compounds which chlorine forms in acting on essence of turpentine, or on the part of the essence which forms a liquid camphor.

M. Dumas remarked that the product $C^{40} H^{24} \underline{Ch}^{8}$ is precisely the compound which he had obtained in treating oil of artificial camphor or essence of turpentine by chlorine. This analysis had not been published. M. Dumas has seen, moreover, that in prolonging the action of chlorine with heat, the compound of which we speak is changed into another crystallized camphor. He has not analysed it.

ON THE FORMATION OF THE ESSENTIAL OIL OF MUSTARD.†

BY M. BUSSY.

It results from these investigations that there exist in the farina of black mustard two principles whose reaction under the influence of water gives birth to the essential oil. One is a peculiar acid which M. B. calls *myronic*. The other is a matter which much resembles albumen, and which he calls *myronine*. This acid is without smell, it exists in mustard in the state of myronate of potassa. Myronine is soluble in water, coagulable by heat, the acids and alcohol, like albumen and the emulsin of bitter almonds. Put in contact with a solution of myronate of potassa, it developes the smell of mustard, and the liquor submitted to distillation yields the essential oil. White mustard contains myronine, but not myronic acid, whence it arises that alone it cannot develope the essential oil. The properties of myronine perfectly explain why boiling water is opposed to the development of the oil, and cannot be employed to make sinapisms.

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* *Journal de Chimie Médicale*, Jan. 1840.

† *Journal des Connaissances Médicales*, January, 1840.

EXAMINATION OF THE SEEDS OF BLACK AND WHITE MUSTARD.*

BY MM. BOUTRON AND FRÉMY.

We know that, when the farina of black mustard is treated by cold or tepid water, a certain quantity of volatile oil is instantly produced. If, on the contrary, this seed is submitted to the action of alcohol at 40°, when the dried cake is taken up again in water, or the product of the evaporation of the alcohol, volatile oil is never produced. It is also known, indeed, that the seed of black mustard, treated by water acidulated with sulphuric acid or alkalised by potassa, does not yield it. These curious facts were announced in 1831 by MM. Robiquet and Boutron; and by M. Fauré.

The beautiful experiments of MM. Liebig and Wöhler concerning the action of the emulsin of sweet almonds on amygdaline, have caused us to suppose that by analogous means we might explain the formation of the volatile oil of mustard. Our investigations have been directed to this end, and we can now announce to the Academy that our attempts have been crowned with ample success.

We have ascertained, indeed, that black mustard contains a peculiar principle, analogous to emulsin, which constantly determines the production of the volatile oil. This principle is soluble in water, and is coagulated at 70° or 80°; it is precipitated in the form of whitish flakes, when alchol is poured into the aqueous solution at 40°. Thus rendered insoluble by alcohol and heat, it is not fit to form essential oil. Sulphuric acid and potash have an action upon it analogous to that of the agents which we have just mentioned. These properties show us why mustard seed does not give rise to the formation of volatile oil when treated by alcohol, sulphuric acid and potassa, or when slightly torrefied.

If the cake of black mustard exhausted by the alcohol be treated with boiling water, a very bitter matter is then dissolved, completely inodorous, and which enjoys the singular property of yielding much volatile oil when put in contact at the ordinary temperature, or, better, at that of 30° or 40°, with the kind of emulsin just mentioned. These facts give then an explanation of the phenomena which, hitherto, remained without solution, and should now place mustard on a parallel with bitter almonds.

White mustard ought also to fix our attention, for, although congenerous with black mustard, it nevertheless presents the most decided differences. It is known, indeed, that this seed never yields essential oil, but that it furnishes an acrid principle when digested in cold water; it is also known that, when treated by alcohol at 38°, it leaves by evaporation a crystalline substance which has been named *sinapisine*. We have ascertained that it is this sinapisine which, under the influence of the emulsin, is transformed into a bitter principle. The acrid principle is not the only one which is formed in this reaction; we believe that there is also produced hydrosulpho-cyanic acid, which has been met with by M. Pelouze in his investigations concerning mustard. If this fact be confirmed, it will form a new point of resemblance to the experiments of MM. Liebig and Wöhler, who have discovered that when emulsin is made to react upon amygdaline, hydrocyanic acid is formed.

We have seen, indeed, that the emulsin of white mustard obtained cold, reacts upon the inodorous matter of the black mustard in such a manner that volatile oil is instantaneously yielded; and we have in vain sought this property in the other emulsive seeds, and especially in sweet almonds and linseed.

IRON PRECIPITATED BY ZINC.†

BY M. CAPITAINE.

To obtain iron by the humid way, it suffices to plunge zinc into a solution of protochloride of iron as neutral as possible. A short time is sufficient, especially if the liquor be brought to boiling, in order that the zinc may become brittle and attractable by the magnet, and by prolonging the immersion nothing more than a friable fragment of pure iron is found. However, as it might be feared that there might still remain a little zinc unattacked, he has devised a contrivance, which is very simple, to avoid this inconvenience. It consists in immersing in the solution of iron a sheet of copper perfectly freed from verdigris and soldered by one extremity to a piece of zinc. It is something like the apparatus employed to obtain the arbor Saturni, and doubtless acts in the same manner. The iron is deposited upon the copper in a thin and friable bed, endowed with a metallic lustre, but not presenting any indication of crystallization; this manner of operating has no other inconvenience than its slowness; but in whatever manner it may be performed, there is always observed a disengagement of hydrogen which lasts as long as the metallic precipitation.

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* *Journal de Pharmacie*, January, 1840.

† *Journal de Chimie Médicale*, Jan. 1840.

INVESTIGATIONS CONCERNING PECTINE.*

BY M. POUMAREDE.

This chemist communicated some results at which he has arrived in the course of investigations concerning the chemical composition of vegetable tissues.

From the facts exhibited in his note, and from several others which he has since proposed to show, he thinks he may conclude:—

First. That the matter which has hitherto been called *Pectine* is an organised tissue;

Secondly. That the cellular tissue of fruits, of roots, of stems and of barks, is no other than this pectine.

Thirdly. That pectic acid does not preexist in plants, but is a product of reactions; indeed, that colouring matter is entirely foreign to this substance.

ANALYSIS OF PROSTATIC CALCULI.†

BY M. BONNAMY, PROSECTOR TO PROFESSOR CRUVEILHIER.

These calculi are in great number; the largest present about 1 centigramme; their surface is polyhedric, and what is remarkable, exposed to the air, from being transparent, they become tarnished, and reduced to dust.

After having pulverised these calculi, 1 decigramme was weighed out, which was introduced into a matrass with distilled water; it was heated for some time, then filtered; the filtered liquor was evaporated at a gentle heat, the residue was hardly discernible; it was yellowish; reddened blue turnsole paper perceptibly. This residue was soluble in nitric acid; the matter evaporated to dryness leaves a lemon-yellow residue; this yellow matter, treated by potassa, becomes reddish, afterwards almost violet.

Another decigramme was weighed, which was treated by alcohol; the alcoholic liquor was evaporated at a gentle heat, the residue, which was scarcely perceptible, presented the same characters as the aqueous solution.

Lastly, 1 decigramme was again taken, and incinerated in a small platinum capsule; the matter was carbonised, afterwards became greyish, and lost by incineration 2 centigrammes; there was then in earthy matter 8 centigrammes. This earthy matter caused a slight effervescence by being dissolved in hydrochloric acid. It is chiefly composed of phosphate and carbonate of lime.

According to these experiments, the calculi examined by us appeared to contain the same matter as those examined by M. Laugier; but their characters, based upon the action of azotic acid and potassa, do not seem to me to belong only to xanthic oxide. It is very well known that all azotic bodies treated by azotic acid give rise to an acid very little known, nitro-picric acid, which, by combining with potassa, yields a salt whose concentrated solution is almost as red as blood. We wished to ascertain whether nasal mucus, saliva, the nails, albumen, and hair, would not exhibit the same property.

For that purpose, we took some dry nasal mucus; we put it in contact with cold distilled water; afterwards it was filtered. A transparent liquor passed off by filtration, which yielded very sensible traces of acidity after its evaporation, and which, treated by azotic acid and evaporation carried on to siccity, took a beautiful yellow colour, which became almost as red as blood by potassa.

The insoluble part of mucus treated by azotic acid presented the same characters, only with a much greater intensity; hair, the nails, and saliva, exhibited the same characters, but albumen is the substance which presented them in the most decided manner.

According to these experiments, xanthic oxide ought only, in our opinion, to be regarded as mucus or albumen, if it is admitted with certain authors that its distinctive character is its yellow coloration by azotic acid, and the red coloration of this yellow matter by potassa.

ANALYSIS OF THE SUBSTANCE OF THE BRAIN.‡

BY M. PELOUZE.

M. Pelouze made known the results of some interesting researches undertaken by M. Frémy concerning the chemical composition of the cerebral substance; instead of the five different matters remarked by M. Couerbe, M. Frémy finds the cerebral substance a very simple composition; it results, according to him, from the union of soda with two new fat acids, thus forming a true soap; M. Frémy has, moreover, recognised the presence of the cholesterine noticed by M. Chevreul; but he has found sulphur only in the albumen which forms part of the brain.

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* *Journal de Chimie Médicale*, Jan. 1840.

† *Ibid.*, Jan. 1840.

‡ *Journal de Chimie Médicale*, Jan. 1840.

II. CHEMICAL MANUFACTURES.

INVESTIGATIONS ON COLOURING MATTERS, AND ON BLEACHING.*

BY DR. ROBERT KANE.

Addressed to M. Dumas.†

" .... I had intended to explore, by a complete work on colouring matters, the primitive, and generally colourless condition of these matters in plants, to determine the laws which govern their successive alterations, and to determine the mode of action by which they are destroyed by oxygen or chlorine, which would present the theory of bleaching. I have already arrived at some results.

" I am persuaded that, in the bleaching action of chlorine on colouring matters, there is, as in other organic bodies, a subtraction of hydrogen, and a formation of a new substance which contains chlorine: it is a true case of substitution.

" From this it results that the old theory of bleaching, which consisted in saying that chlorine acted by decomposing the water, and setting free the oxygen, is false; if dry chlorine has but a weak action, it is on account of its gaseous state. The same as by making oxygen or chlorine act upon alcohol, we obtain two series which terminate in acetic and formic acids; by employing a coloured substance, we obtain nearly similar results; but as the new matters are in general colourless, the process is called bleaching.

" I have not been able by any process to procure the erythrine of Heeren. I have obtained in great quantity the substance which he has called pseudo-erythrine, and have determined its constitution and properties. This body does not combine with bases, but yields by decomposition two substances: the first is *saccharoïde*, the identity of which with orceine I have not been able to determine; the second is the bitter of erythrine; they yield orceine by the concurrence of oxygen and ammonia.

" I have analysed many compounds of orceine with the oxides of copper, silver, and lead. The state of azote in orceine is a point of great theoretical interest. I think that it exists in it in the state of amidogen, and that the compounds of orceine with bases resemble those complex metallic amidurets or amidides, of which I have shown so many examples.

" I have been led to form this opinion by the manner in which chlorine acts upon it; the reaction is interesting, because it applies the general mode of the action of chlorine on organic substances to the phenomenon of bleaching. Orceine is not decoloured by chlorine. Azote is eliminated in the state of sal ammoniac, and a violet-coloured substance, insoluble in water, is formed, to which I have given the name of *chlororceine*. But orceine may be decoloured in another manner: if a piece of zinc be put with a little acid into a solution of orceine, it is decoloured by the nascent hydrogen, and a matter is formed which I have called leucorceine, which gives white lacs.

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* *Journal de Chimie Médicale*, Jan. 1840.

† All chemists are aware that our learned brother, M. Robiquet, has long since demonstrated the important fact, that the colouring matter of the archilla of commerce pre-exists under the form of a saccharine and colourless matter, which has been designated by the name of *orceine*, and concerning which Dr. Kane has just made some interesting observations. They will also call to mind the investigations concerning turnsole, which science owes to our illustrious president, and which the analyses of Dr. Kane tend to complete.

I will also call to mind that among the facts which Dr. Kane's letter contains, there are two which are confirmed beforehand by my own personal investigations. I have indeed published analyses which prove that blue indigo passes to the white state by the removal of its hydrogen. Moreover, I have long since produced and analysed the matter into which indigo is transformed under the influence of chlorine. Far from being coloured, as is generally supposed, indigo is converted into a matter of a beautiful red colour. This conversion is performed by the ordinary process, namely, the chlorine displaces the hydrogen, and takes its place in such a manner as to constitute a new chlorated matter, or rather a chlorate body belonging to the same type as indigo.

I have shown, described and made known this matter in my public courses for several years; and I should be inexcusable in not having published my observations, if there had not remained some doubts concerning the formula of the red matter, and if those doubts did not arise from a cause which I have not hitherto been able to overcome, namely, the presence of a little sulphur in the indigo prepared by the sulphate of iron and lime, as in ordinary. Whence result some traces of chloride of sulphur with which the red matter remains impregnated, and which always affects a little the dose of chlorine.

"Sulphuretted hydrogen yields with orceine a colourless compound, which cannot be obtained in the solid state; it is the same with the purple compound produced by ammonia.

"When orceine is put in the conditions which determine the conversion of raw lichen into coloured archilla, and when it is decomposed, the result is the carrying away of all its azote with hydrogen, oxygen and carbon, forming together an ammoniacal salt: there results from it a substance to which I give the name of *erythroleic acid*. It is a semi-fluid unctuous substance at the ordinary temperature. It does not contain azote. Its solution in ether is of a beautiful binous red; ammonia renders it *purple*. This substance exists in the archilla and turnsole of commerce.

"The turnsole of commerce contains two principles; the first is soluble in alcohol, and in water, the second is insoluble. The soluble part consists of an acid which I call *litmic acid;* it is combined with ammonia and potassa. The insoluble part is composed of litmic acid in small quantity, but in part of another acid which I call litmylic, and besides erythroleic acid, united to lime, and mixed with a great quantity of clay, gypsum and other foreign matters. I have examined many salts formed by these new acids, and have completely determined their characters and formulæ. Litmylic acid contains the same quantity of carbon and hydrogen as erythroleic acid; it only contains more oxygen. But in litmic acid, half the hydrogen of litmylic acid is replaced by oxygen.

"These acids of turnsole, which are red in their natural state, turn blue with alkalies, and form blue or purple metallic salts; but they are singularly unstable. The blue compounds of ammonia, instead of being well-characterized salts, lose all their ammonia at the temperature of 100° Cent. Indeed, I am disposed to think that the metallic oxide in these compounds replaces the water of constitution and not the basic water, and for this reason they may be removed by very feeble affinities.

"A very curious property of litmic acid confirmed me in this view. If litmate of lead is treated by sulphuretted hydrogen litmic acid remains combined with the sulphuret of lead, and can only be separated from it by means of a soluble oxi-base with which it combines in preference. We have then classes of bodies which, representing litmic acid by L, are composed $L + HO$, $L + HAZ$, $L + HS$, $L + PBO$, $L + PBS$, &c. This more resembles the substitution of the water of hydratation than the basic water. If it were thus, the names of lithmine and lityline would be more proper.

"The action of chlorine on these compounds produces two bodies to which I have given the names of *chloro-litmine* and *chloro-titmytine;* they are of a yellowish brown, but this case is analogous to the phenomena of bleaching: I have analysed their combination with the metallic oxides, and have determined their constitution. I have obtained *leuco-litmine* and *teuco-litmyline* by nascent hydrogen; but I have not been able to isolate them in a state to allow of their analysis. I have not found that the process of Desfosses, to obtain decolored turnsole by protoxide of iron, is useful.

I am persuaded that in these cases of decoloration, the effect is not produced by a subtraction of oxygen, but rather by the addition of hydrogen, as has been found in the conversion of blue indigo into white. I regard the evidence on this point as perfectly complete.

"I call *atmerythrine* a very remarkable body, discovered in the course of my investigations. It is volatile; its vapour is of a brilliant red, as its name indicates. It is condensed under the form of brilliant bracteæ, which melt easily and are of a greenish red. It is soluble in alcohol, insoluble in water. It is not formed when litmate or litmylate of lime are slowly heated, or rather these acids mixed with lime or gypsum. No trace of atmerythrine is obtained by heating alone litmic and litmylic acids. It is probably a product of decomposition, which, without doubt, has the same relations as acetone has with acetic acid. I have never been able to obtain enough of it to submit to analytical investigations.

"To separate and distinguish the three matters of turnsole, suffice it to say, litmic acid is soluble in water, very little soluble in alcohol, and insoluble in ether. Litmylic acid is easily dissolved in alcohol, but very little in ether and in water; while erythroleic acid is almost insoluble in water, but readily soluble in alcohol and in ether."

ON THE USE OF THE STRIPS OF PLATE BORDERING THE SHEET FOR RECEIVING A PHOTOGRAPHIC IMAGE BEFORE EXPOSING IT TO THE VAPOUR OF IODINE.*

EXTRACT OF A LETTER FROM M. DAGUERRE.

The author commences by making known several processes which he had formerly put in practice, with the view of determining an equal distribution of the iodine throughout the extent of the plates destined to receive photographic images; and after having pointed out the reasons which have led him to prefer the employment of languets in the metal, he adds:

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* *Comptes Rendus*, No. 3, Jan. 1840.

"The following experiments have convinced me that it is indispensable that these strips be of the *same nature as the plates:*

"1st. In turning the strips, that is to say in putting the copper uppermost, the edges of the plate were surcharged with iodine:

"2nd. In substituting for the metallic strip, strips of glass, the bed gains the same in intensity on the edges:

"3rd. In covering some parts of the strips of plate with gum lac, the same effect takes place in the parts where the bed of gum lac is met with, and terminates immediately at its side:

"4th. In employing strips of platinum instead of sheets of silver, the bed still increased upon the edges:

"5th. In keeping the strips on the card-board, the effect was the same.

"Without the difficulty of fixing them, the bands," further says M. Daguerre, "might be reduced to the size of 3 millimetres; for it is sufficient, for them to produce their effect, that there be solution of continuity between them; and what proves it is, that nearly the same result was obtained by engraving, at 3 millimetres from the edge of the plate, a sketch deep enough to reach the copper. Although this means might substitute the strips, I have not pointed it out in my description of photographic processes, because it presents inconveniences. At length, during the cleansing of the plate, the incised engraving is filled with coal-dust or tripoli, and afterwards, in washing, it retains some water which occasions stains.

"This is," pursues the author, "a recent experiment, which gives nearly the same results as the strips; although this may not be practicable, I here give it as a good fact to be proved; in disposing round the plate, laid flat, a border, either of pulverised starch, or lime, and allowing the vapour of iodine to descend upon it by means of the little saturated board, the starch, and better still the lime, absorb the iodine with avidity, and the layer is very regularly distributed.

"I will add a few words concerning my last apparatus for iodizing the plates. Every one may judge of its great simplicity, since it consists merely in a little box containing two grooves, one to receive an iodized plate, and the other for the little board upon which the plate is fixed. But it is not known that it is unnecessary to renovate every time the plate supersaturated with iodine, for once impregnated, it may serve not only a whole day, but several days in succession without being again renovated in the iodizing box; the promptitude is not very sensibly relaxed, provided, however, that the iodised plate be kept in the little box with grooves in it.

"If the effect were too rapid, it might be retarded in two manners; either by making in the box a third groove, to remove to a distance the little board (which does not complicate the apparatus), or by turning the box to let the vapour of iodine descend, which relaxes the effect two-thirds. But I am not yet certain that the vapour of iodine, in descending upon the plate, is arranged on it in the same manner as in rising, and that the layer thus obtained is as favourable to the reproduction of the image and the arrangement of the mercury."

ON THE IODURATION OF METALLIC PLATES FOR RECEIVING IMAGES, AND ON THE USE OF THE STRIPS OF PLATE WITH WHICH IT IS CUSTOMARY TO SURROUND THEM.*

NOTE OF M. SEGUIER.

Wishing to assure myself by experiments, of the part which the little strips of silver plate perform with which M. Daguerre advises, with reason, the plates of metal to be surrounded at the moment when they are submitted to the vapour of iodine, I perceived that these little strips act by preserving the edges of the plate from the radiation of the iodine accumulated in the sides of the boxes in which the operation is performed.

It is important then, in order that they may produce their effect, that they be cleaned at each operation, for when they are covered with iodine, they no longer stop in its passage the iodine radiating from the sides towards the plate of metal.

Two means are presented to avoid the inconvenience of excess of iodine on the edges of the plate: it is necessary, either to withdraw the plate from the radiation of the sides, or to prevent the sides from being charged with iodine.

I stopped at the following method. A box of hard wood, varnished internally with gum lac, contains a lump of soft wood furnished with a card of cotton sprinkled with iodine. Upon this is placed a little plate covered with card-board on each of its faces. One of these card-boards furnishes by radiation to the plate metal the vapour of iodine, while the other returns to the cotton that which it had lost. It suffices to turn the plate from time to time in order that the operation may be continued with the same rapidity.

A plate of glass is placed upon the upper card-board, where it is not operated on. Two little frames of hard wood, varnished with gum lac, one of a centimetre, the other of two centimetres in height, serve to sustain the plate above the card-board charged with the iodine.

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* *Comptes Rendus*, No. 1, January, 1840.

By employing only one of these frames or combining them, three distances are obtained; thus, that may be chosen which best suits the state of the heat of the atmosphere. In summer the operation would proceed too quickly at the distance of one centimetre; the two frames put one upon another will give a distance of three centimetres, which is very convenient for this season.

In winter, on the contrary, the frame of two centimetres or even that of one, will operate with facility and promptitude.

M. DAGUERRE'S PROCESS.*

BY M. G. BAYEUX.

A plate of copper silvered over is taken, which is carefully scoured with dilute nitric acid, this scouring being with the view of entirely freeing the surface of the silver from all foreign matters which might be attached to it, and to render even this surface more level. Afterwards the several operations pointed out by M. Daguerre are proceeded with, and which I will divide, in order to explain them in a clearer manner.

First Operation.—The silvered side of the plate is submitted, in a closed box, and sheltered from all light, to the action of the vapours of iodine produced by a small quantity of this element, which had previously been placed in the bottom of the box, and which is gently heated; this vapour passes through a fine and light gauze, which sifts it and spreads it uniformly on the surface of the metal; the iodine combines with the silver, and forms with it a light layer of iodide of silver which is extremely thin, since in the pictures exhibited by M. Daguerre it only equalled a millionth of a millimetre in thickness.

Second Operation.—This plate is afterwards transported, without undergoing the action of light, into the camera obscura, in the focus of which it is placed; the light then acts upon the iodide of silver, which is totally decomposed in the parts struck by the luminous rays; it is only partly so in the parts which, although in the shade, are however illuminated by the reflected light; indeed it remains intact in the parts entirely in the shade; in this decomposition the iodide of silver is changed into reduced silver, which has neither the colour nor metallic lustre of ordinary silver on account of its extreme division.

Third Operation.—The plate is next submitted to the slow action of mercurial vapours, excited only by a temperature of 75 centigrade degrees; the mercury is united to the reduced silver, forming an amalgam of silver, while it is without action on the iodide of the same metal: there is then formed in the parts which have been struck by light, an amalgam of silver, which is white, and which is so much the less mixed with iodide of silver as the parts have been more subjected to the action of light: there the drawing commences to appear in which the shades are marked by more or less iodide of silver, according to their intensity.

The operation succeeds better, according to M. Daguerre, when the plate receives the vapours of mercury at an angle of 45°, than if it were placed parallel with the surface of the mercury. I think that in this case the action is purely mechanical, and that if it did not succeed in the supposition of parallelism, it is because the vapours of mercury, which are extremely heavy, and which, besides, have no current, would remain stagnant, and would be more difficultly combined; while under an angle of 45°, the vapour glides against the surface of the plate, and combines with it more easily, since it is renewed quicker.

Fourth Operation.—The drawing is then plunged into a solution of hyposulphite of soda; then the plate acts as an element of the Voltaic pile would do, and decomposes a portion of the water of the solution; the hydrogen of this water is carried to the iodine, forming hydriodic acid, while the oxygen is absorbed by a portion of the hyposulphite of soda which passes to the state of sulphite of the same base; the hydriodic acid which is free, reacts upon another small portion of hyposulphite of soda which it decomposes, seizes its base, forming with it hydriodate of soda, liberating a small quantity of hyposulphurous acid; but this, as is known, cannot exist free, it is therefore decomposed as soon as it is separated from the soda, into sulphur and oxygen; the oxygen is absorbed by a third portion of hyposulphite of soda, while the sulphur is united to the silver, forming a sulphuret of silver, which substitutes on the plate the iodide which existed there previously, and which is thus met with on the parts in the shade. This fourth operation is evidently much more difficult to explain than the others; however, this theory appears to me the simplest and most natural, in as much as it explains why the copper, plated with silver answered better than silver alone.

The washing with distilled water which it is made to undergo in the last place, is only with the view of removing all the solution of hyposulphite of soda which might remain upon the picture, and render it less clear.

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* *Journal de Chimie Medicale*, Jan. 1840.

Thus, in the first stage of the operation an iodide of silver is formed upon the surface of the plate :

In the second, light decomposes this iodide, and returns the silver to the metallic state without lustre, on account of its division :

In the third, the mercury forms an amalgam with the reduced silver, and commences to make the parts appear which were struck by the light :

Lastly, in the fourth, the contact of the hyposulphite of soda changes the iodide of silver of the shaded parts into sulphuret of silver, which is black, and not attackable by light ; whence results the formation of the shades and the fixation of the drawing.

This is, in my opinion, the theory of M. Daguerre's process, which at first sight appears very confused, but which on reflection is easily understood.

ON THE REFINED CASHOO OF COMMERCE.*

BY MM. J. GIRARDIN AND F. PREISSER.

The note published by M. H. Reinsch, on the artificial preparation of brown cashoo (see *The Chemist*, No. I. p. 21) induces us to make known a kind of fraud which druggists commit with respect to cashoo, since this substance has been ranked among tinctorial matters. If tradesmen would be contented with converting yellow cubic cashoo into brown cashoo by fusion, less blame would attach to them, for these two kinds of cashoo have nearly the same tinctorial qualities. But what is truly blameable, is the introduction into brown cashoo of an insoluble and inert matter, which causes a great pecuniary disadvantage to the manufacturers who make use of this juice as colouring or tanning matter.

Since 1836, the epoch of the greatest consumption of cashoo in dye-houses and calico manufactories, the druggists of Paris have sent to Rouen a new kind of cashoo, under the name of *refined cashoo*, whose external appearance sufficiently indicated that it was the result of French manipulation. This product is in pieces of a brown tint, a smooth and glossy surface, flattened, with mossy edges, and appearing to have been drawn in the form of a semi-fluid extract, on a plan by which they were at once cooled and hardened. These pieces, of the weight of 500 grammes several kilogrammes, have a vitreous cassure of a reddish-brown, a very bitter and astringent taste, and adhere very firmly to the papers which cover them.

In 1837, a dyer of Rouen brought us a sample of this *refined cashoo*, begging us to tell him if it were really purer than the *brown cashoo extracted from the leaves* of colcutta which he exclusively employed in his manufactories. The experiments which we made on this occasion apprised us that it contained 40 per cent. of a foreign matter. This is the manner in which we detected this fraud.

Far from almost completely dissolving in warm water, weak alcohol and acetic acid, in the same manner as pure cashoo, the so-called *refined cashoo* left a residue nearly equal to half its weight, pulverulent and of a deep black, which disengaged upon coals a strong smell of animal matter, and which, by calcination in close vessels, gave abundant ammoniacal vapours.

This residue coloured an alkaline solution brown ; by an ebullition of some minutes in a solution of potassa, it was almost completely decolored, but it increased considerably in volume, and by continuing the boiling, quite disappeared.

Hydrochloric acid dissolved part of this residue, by the aid of heat, taking a dirty brown colour and acquiring a viscous consistence ; the undissolved part presented a much more considerable volume than the powder put in contact with the acid.

Acetic acid and alcohol removed but a small portion of the colouring matter.

Ammonia was coloured a deep brown, and by repeating upon the residue the action of this alkali, it concluded by removing all the colouring matter, and left no more than a greyish filamentous matter, which possessed all the characteristics of fibrin !

It is evidently not fibrin which is added to the refined cashoo ; every thing has shown us that it is dried and pulverised blood, which is introduced into the extract a little before casting ; it is indeed the only substance which presents the characters we recognized in the insoluble residue of the refined cashoo, and whose colour so much resembles that of brown cashoo, that it would be difficult for the eye to detect its presence.

This fraud is not only prejudicial to the consumer, by the pecuniary loss which he sustains from the purchase of a matter inert in dyeing ; there is, moreover, the serious inconvenience of introducing into the vats a substance which retains obstinately a great part of the colouring principle of the cashoo ; this substance is fibrin, which, we are assured by direct experiments, possesses a decided affinity for colouring matters ; whence it follows, that in making use of the *refined cashoo*, not only is all the portion of the product represented by the dried blood lost, but also much of the colour which remains combined with the fibrin. Thus it is not 40 per cent. of residue which remains at the bottom of the vats, but 60 or 70 per cent. And indeed the cashoo added to blood scarcely colours boiling alcohol; so energetically does the fibrin retain the colouring principle of cashoo.

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* *Journal de Pharmacie*, January, 1840.

We will say, in conclusion, that good cashoo extracted from the leaves of colcutta is dissolved in boiling water, leaving only a weak earthy residue, equal to 3 per cent.; that it only contains 11 or 12 per cent. of matter insoluble in boiling alcohol, a matter entirely formed of salts and gum; indeed, that it only gives by calcination 3 or 4 per cent. of ashes which are rather alkaline, but not ferruginous.

ON THE ALCOHOL WITHDRAWN FROM THE FULMINATES OF MERCURY.*

The preparation of fulminates of mercury, which is commonly made on the large scale for the manufacture of primes, gives rise to a disengagement of vapours which much incommoded the workmen before the means of working in closed vessels was discovered. Now, not only are they defended from these emanations, but there is gathered an etherial alcoholic liquid, of a very complex nature, for it contains mercury, formic and acetic acids and their ethers, hyponitric and hydrocyanic acids, and some other bodies. After some fruitless attempts made to render this liquid useful, a manufacturer, M. Goupillat, has found a means, for which he has taken out a patent, of procuring from it pure alcohol; this means consists in saturating the liquid acid with chalk, and distilling the product separated from the solid residue.

Authority has been consulted to ascertain whether such products might be allowed to circulate in commerce without danger; M. Gauthier de Claubry, member of the Council of health, has made a report on this subject, and although he has acknowledged that pure alcohol might be thus obtained, as negligence in manufacture might allow hydrocyanic acid to pass into it and occasion accidents, it has been decided that it would not be sold in commerce without being perverted in such a manner that it could not be taken as a drink.

ON THE ADULTERATION OF WAX.†

BY M. BONNARD.

A sample of wax which appeared very impure was presented for the examination of M. Bonnard. He recognized, by dissolving it in essence of turpentine, that it contained sixty per cent. of fecula. He also employed, on this occasion, another means of analysis which succeeded equally well: he boiled a mixture of one hundred parts of water and two parts of sulphuric acid, and threw into it by small portions the adulterated wax; the acidulated water saccharifies the fecula, which remains entirely dissolved in it, while the purified wax may be gathered from the surface after being cooled, and weighed to ascertain the proportions of it.

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[*] *Journal des Connaissances Médicales*, January, 1840.

[†] *Journal des Connaissances Médicales*, Jan. 1840.

III. PHARMACY, &c.

EFFECTS OF ALCOHOLIC DRINKS ON MOTHERS AND INFANTS.‡

BY A. COURTENAY, SURG., R.N.

I have resided in Ramsgate during nearly eight years, and have in that time attended 1,127 midwifery cases, and have invariably found that, other circumstances being equal, those mothers who never tasted malt liquors, wine, or spirits, during and subsequent to the period of labour, have had the easiest labours, the earliest recoveries, and the best health afterwards. Nay, more, I know several mothers who never could nurse their children, under the ale and porter system, without suffering greatly in health, but who, after relinquishing the use of those baneful stimulants, have experienced a perfect freedom from disorder during the period of lactation. Nor was this all. The offspring of such mothers have enjoyed an unprecedented immunity from disease also.

That some females do not feel their health disordered whilst using those drinks, I am ready to admit, and that their tender infants, also, may escape, for a time, with impunity, is certain, but that both mother and child suffer more or less, in proportion to the quantity of these drinks taken by the mother, at a remote period, if not at the immediate time, is to me as certain as that I am now writing. Nor do I see how it can be otherwise, according to the laws which govern the animal economy. Let any man

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[‡] From *The Lancet*.

in extensive practice, any man who is accustomed to reflect, review the state of health of the great majority of ale and porter drinking mothers during and after the period of child-bearing, and then say whether their health is what it should be had they lived according to nature's dictates. In affirming that it is not, the mass of disease that presents itself amongst this, the better part of created beings, strongly confirms the assertion. I have under my own eye many mothers who are experiencing the ill effects of the moderate (not the immoderate) use of these falsely-denominated "strengthening" beverages, in the form of liver and stomach complaints, skin diseases, asthma, dropsy, &c., and every impartial and observant member of the profession must have noticed similar results. Thousands of children are annually cut off by convulsions, &c., from the effects of these beverages, acting through the mother.

Strong drinks excite a feverish state of the body, and create an artificial thirst, — a thirst which is not expressive of any real want of the constitution, but a certain proof that the want does not exist. The greater the craving for them, under these circumstances, the more certain we may be that they are not needed, and that they will cause positive mischief to both mother and child. The constitutions of both are stimulated beyond what nature ever intended that they should be. The laws which govern the animal economy are positively infringed, and it is impossible that either mother or child can escape the penalty of that infringement. Both will suffer to a certainty in some shape or other; if not immediately, at a future period.

WATERY SOLUTION OF OPIUM IN VENEREAL EXCRESCENCES.*

M. Venot, of the Venereal Hospital, Bourdeaux, having been disappointed in the various remedies which he had employed for the treatment of venereal vegetations, determined to try the efficacy of the narcotic lotions, recommended by M. Desruelles. His experiments were most successful, and from them he draws the following conclusions:—

1. The solution of opium should be fresh and concentrated, an ounce of water containing at least one drachm and a half of opium.
2. The white dry epidermoid vegetations do not yield so readily.
3. All cases of mucous vegetations, moist warts, condylomata, &c., are almost certainly cured by the watery extract of opium, especially if employed after general treatment.
4. The local action of the remedy is manifested in the following manner: — the vegetations dry up, become pale, then yellow, brown, and finally waste away.
5. This action, which is evidently poisonous, may extend to the healthy parts and determine certain accidents, against which the physician must be on his guard.

CORRECT VACCINATION, AND IMPEDIMENTS THERETO.*

[*As there is no more interesting object of Pharmacy than the Vaccine Virus, we have given insertion to this Paper.*]

In order that the subsequent observations may have a clear and definite meaning, we think it necessary to lay down plainly what we conceive to be required to render the process of vaccination as perfect as possible. We have been constrained to adopt this course from observing the great discrepancy that exists between the statements of different individuals with respect to its protecting power, which we are convinced could not have happened to such an extent, had uniformity of practice been followed.

From the commencement of this practice, efforts were made to ascertain when it had fully taken hold of the constitution, so as to afford reasonable hope of future security. The comparative mildness of the affection rendered this an important point of consideration, and up to this hour it has lost none of its interest. The only perfect test is that which arises from the insertion of the variolous lymph, but as that is on many accounts objectionable, it is better to find out, if possible, some other.

The first to which we would advert is the regular progress of the vaccine vesicle, and we would lay it down as an axiom never to be forgotten, that no one is qualified to speak of its effective character who has not, at suitable periods, noted this progress. The genuine disease can only be produced by pure lymph from a regular source. The time for taking this lymph according to Dr. Jenner, is between the fifth and eighth days, and before the formation of the areola. Others have recommended the use of lymph taken at a much later period; but this we believe to be a very questionable practice, and ought [which ought] never to be followed. It is very true that the affection may be propagated by virus found in the scab, but this only succeeds [succeeds only] when active lymph is preserved in a dried state within the scales.

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* From *Gaz. Med. de Paris*, Jan. 1840, and *The Lancet*.

* From the Report published by the Provincial Medical and Surgical Association; in the *Medical Gazette*.

A test, dependent upon the successful progress of vaccination, was very early noticed by Dr. Jenner, and subsequently brought forward by Mr. Bryce, of Edinburgh. He proposed that some fresh vaccine lymph should be inserted into the patient a few days after the first vaccination. This practice was founded on the observation that the second vaccination proceeds with accelerated speed, provided the first has taken effect. It is a very simple and beautiful illustration of the constitutional effects of vaccination, and deserves to be encouraged. An experienced eye will for the most part be able to detect any deviation from the true vesicle. Unfortunately, the means of making correct observations are often denied to medical men, and anything that would secure greater attention to this branch of the subject would be of high value, and unquestionably would have prevented many of the failures that have recently taken place.

The second point demanding unvarying assiduity, is the character of the lymph employed. It never ought to be taken from a vesicle which deviates in the least degree from the perfect standard, nor from a patient labouring under any cutaneous disease. It is to be feared that these rules have not been punctually observed; and that deviations have been propagated, which afford varying degrees of security, according as they approach to or recede from the healthy character.

A third point which ought ever to be insisted upon, is the leaving one or more vesicles to run their course without being in any way disturbed. This canon was introduced at a very early period, but we have more than cause to suspect that it has been often defeated, either by the carelessness of parents, or the hurried manner in which vaccination is sometimes performed.

Another point on which perhaps too much stress has been laid, is the appearance of the cicatrix. It is true that after regular vaccination, it generally assumes an uniformity of aspect well known to medical men. The medical officers of the army and navy are compelled to rely a good deal on its appearance; and all recruits on whom it is supposed not to be perfect, are subjected to vaccination. The experience obtained from these services, is, so far as it goes, in favour of information derivable from this criterion. We are satisfied, however, that by itself it ought never to be absolutely trusted, and we must repeat here, what we have already observed, that nothing but a watchful inspection of the progress of the vesicle will justify any one in speaking with confidence of the security likely to be attained.

From all we can learn, we are inclined to believe that though the presence of a perfect cicatrix is not a sure sign of protection, its absence must be held to speak strongly against the existence of vaccine influence. The peculiar appearance of the cicatrix is caused by the reticulated or cellular structure of the vesicle. The same organization occurs also in variola. Now, if the vesicle has been repeatedly opened or broken, the ulcerative process that succeeds destroys the organization of the cells, and leaves a cicatrix nearly smooth, instead of the well-defined indented surface, which may for the most part be seen after complete vaccination. It may also be observed that many persons who have been extensively marked and seamed by small-pox have had subsequent attacks of that disease, proving that after perfect human small-pox, as well as after perfect cow small-pox, a second attack may occur.

Mr. Dodd, of all our correspondents, seems to have paid most attention to this part of the subject. Of fifty-seven cases that had been exposed to the contagion of small-pox and escaped, in six only was the cicatrix perfect; in fourteen it was slightly defective; in thirty it was very imperfect; and in seven it was totally wanting. Out of seventy-seven cases of small-pox after vaccination, one bore a perfect mark, fourteen had the cicatrix slightly defective, forty-seven were imperfect; and fifteen had none at all. Thus, to sum up the whole, out of one hundred and thirty-four cases of vaccinated persons who had been exposed to small-pox, the cicatrices of seven were perfect, and one of these failed; twenty-eight slightly defective, of which fourteen failed; seventy-seven very imperfect, forty-seven of which failed; twenty-two had no marks at all, and of these fifteen had small-pox, while seven altogether escaped.

Our correspondents amply justify us in laying down the foregoing principles; and we also think from the evidence before us, that vaccine lymph, though passed through a great number of subjects, and used for a great number of years, does not necessarily become deteriorated. This, however, can only be said when unceasing attention is paid to every successive transmission; for if a deviation commences, it may be perpetuated, and afford a gradually decreasing protection. There is no doubt that lymph of this kind has been often used. We have satisfactory illustrations of this truth from several of our returns. We will mention one out of many of this hind. Mr. Fox, of Cerne Abbas, thinks that more cases of small-pox have occurred after vaccination performed ten or twelve years, than after vaccination performed thirty years ago, and that this arises from the extensive propagation of imperfect cow-pox, which only affords a diminished amount of security. A remarkable instance came under his observation a short time ago. A father and two children were inoculated with fresh small-pox virus from the same child, and at the same time; both children caught the disease, and the father escaped, though he had been vaccinated more than thirty years. It will be observed in subsequent parts of our Report, that failures are noticed at all periods from a few weeks after vaccination up to thirty or more years. It has been supposed that they are most common at and after the age of puberty; but this is certainly not the opinion of our correspondents in general. Some, it must be admitted, do affirm that small-pox has more frequently occurred in persons recently vaccinated than in those at a remote period, while others assert that time makes no difference.

The influence of cutaneous diseases on the progress of the vaccine vesicles is a point, too, demanding greater attention than it has hitherto obtained. At a very early period Dr. Jenner discovered that the affection was very much modified in its progress by the scaly tetter, and those affections described by Dr. Willan under the term *psoriasis*, as well as those vesicular eruptions commonly called herpetic. He observed that vaccination performed on a skin occupied by any of these diseases, "produces every gradation from that slight deviation from perfection, which is quite immaterial, up to that point which affords no security at all." We have seen the herpetic affection occupying the angles of the mouth, the upper portion of the lip near the nostrils, or the tender skin behind the ears, cause the vaccine vesicle to assume an incorrect form, containing an opaque fluid, with an irregular efflorescence of a dusky red colour. We have also seen similar irregularities commencing from a like cause, which completely disappeared on destroying the herpetic affection, by applying a little of the liquor plumbi. The case to which we at present refer, was under the immediate direction of Dr. Jenner himself. The premature and jagged efflorescence round the vaccine vesicle had appeared. He immediately detected the cause; and by the application above alluded to, destroyed the disease of the skin. In a very short time the deviation disappeared, and the vaccine affection subsequently ran its course in a regular manner. It does not uniformly happen that vaccination is thus impeded by the pre-existing cutaneous maladies; but wherever the disturbance is in the slightest degree manifested, the vaccination ought to be distrusted, and repeated as soon as the skin has been brought into a healthy state. —It is a very long time since these truths were impressed upon the public mind; but we have had many proofs that they are not yet sufficiently considered; it is, therefore, our duty to recall them. Dr. Jenner's last publication particularly refers to this point of practice; and we know that it caused him much disquiet that his admonitions and instructions were so little heeded.

Among those of our correspondents who have had most experience, and whose success has been most uniform, we find unequivocal testimony to the accuracy of Jenner's doctrine on this head. Many have made no observations at all respecting it; while some mention dentition, general ill state of health, scrofula, &c., as impediments to vaccination.

Other constitutional peculiarities stand in the way both of human small pox and cow small-pox. Some resist these affections at one period of their lives and not at another; and there are examples of the very opposite condition, which show that the individual will receive either infection as often as it is presented to him. These peculiarities frequently run in families. We know several children of the same parent, who have had modified small-pox after cow-pox; and not many months ago three brothers had small-pox after small-pox, one of these cases proving fatal. On this subject we have illustrations from Mr. Dodd, who tells us that six brothers and sisters in one family having been vaccinated when children, had the small-pox a few years afterwards. In another instance, two sisters, vaccinated in infancy, were subsequently inoculated, and had small-pox slightly; they both caught the small-pox again in 1837, and one of them had it very severely. Their father caught small-pox; their mother too, who was inoculated when young, had it again in the same year; their maternal grandfather, beholding from a window at night, the funeral of a friend who had died of small-pox, sickened of that disease and died. These are a few of the affinities and concordances between human small-pox and cow small-pox; and we doubt not that every subsequent observation will establish the analogies. In confirmation we farther remark, that the great object of inoculation with human small-pox was to produce an affection as much like that of cow small-pox as possible, and by great care in selecting the virus to be employed, this was sometimes accomplished in a very remarkable degree. On the other hand, it is known that the disease, when casually caught from the horse or cow, is often a severe one—as severe, it was said by an experienced observer, as for the most part was inoculated small-pox. We ourselves have seen it, when caught from the horse, exhibiting great intensity, the hands and arms being covered with the eruption.

We will conclude this subject by an extract from one of Dr. Jenner's unpublished letters. "The greatest of all impediments to correct vaccination is that which arises from an herpetic state of the skin; indeed, compared with this, all the rest are as dust in the balance; and when the rules which I have again and again laid down respecting this point, and for so long a period, are attended to, then, and not till then, will the confidence of the public be fully established as to its preventive power."

ON VACCINE MATTER.*

The Academy of Sciences of Paris has proposed the following question as the subject for a prize of 10,000 francs, to be accorded in 1842.

Is the preservative power of vaccination absolute, or is it only temporary?

In the latter case, determine by precise experiments and authentic facts, the time during which vaccination defends from small-pox.

Has recent cow-pox a more certain, or more permanent, preservative power than the vaccine matter which has been already employed in a greater or smaller number of successive vaccinations?

Supposing that the preservative power of vaccine grows weaker by time, should it be renewed, and by what means?

Has the greater or less intensity of the local phenomena of vaccination any relation to its preservative power?

Is it necessary to vaccinate the same person several times, and, if it be, after how many years should the vaccination be repeated?

The memoirs for this prize must be sent to the Secretary of the Academy before the 1st of April, 1842.

In a memoir† recently published by Professor Otto, of Copenhagen, he concludes, 1. That the vaccine virus has lost none of its original power. 2. That a child cannot be vaccinated too soon after birth. 3. That the protective influence of the virus gradually diminishes with time; in some, perhaps the greater number, after a certain lapse of years. 4. The nature of the cicatrix does not enable us to determine how far the disease will be modified. 5. Small-pox, occurring in the vaccinated, is always modified, and the more so, the younger the person. 6. Regular variola, in the vaccinated, appeared only in persons who had passed the age of fourteen. 7. Out of ten vaccinated persons who died, none had passed the age of twenty-three. 8. Not a single case of small-pox had, as yet, occurred in the re-vaccinated.

ON POISONING BY CONCENTRATED ACIDS, AND ON THE FIRST AID TO BE ADMINISTERED.‡

BY A. CHEVALIER.

Hitherto the greater number of practitioners have agreed in establishing, that the first assistance to be given against acids consisted in the administration of alkalies, and particularly of decarbonated magnesia, numerous facts seem to show the good effects of this medication.

Now it is settled that this mode of procedure is not rational, and that another method must be followed, It is supposed that all the ingested acid is absorbed, and it is decided that acids are cold or hyposthenisant poisons. 1st, The poisoned subject must be made to vomit by irritating the æsophagus with a feather; 2d, that he must, without delay, be made to drink pure wine, mixed with warm broth; 3d, that magnesia may be added to the drink, if it be presumed that unabsorbed acid remain in the stomach.

We think that the method which ought to be adopted is that which facts have shown to be attended with success; then, if those authors who have published facts on poisoning by concentrated alkalies be consulted, it is evident that in most cases the alkalies, when they have been employed in time, have saved the patients. If it is enquired what are the facts which may allow the results of the newly recommended method to be studied, but few will be found, at least to our knowledge. What ought we to conclude from these investigations?—that the most certain mode must be employed, and experiments must not be made on man to establish the value of such and such a method.

We think that experiments made on animals might elucidate the question; we protest that they be tried by persons whose object it is to establish that the anti-hyposthenisant method ought to supersede the summary one of saturation.

To put our readers in a situation to study facts, we will here point out, 1st, the cases of poisoning by concentrated acids come to our knowledge, and in which the method of saturation has been successful; 2d, cases in which autopsy has shown that acids are not absorbed, as has been pretended.

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* *Comptes Rendus*, Dec. 30th.

† *L'Experience*, No. 128, 1839.

‡ *Journal de Chimie Médicale*, Jan. 1840.

CASES OF POISONING TREATED SUCCESSFULLY BY ALKALIES OR BY SUBSTANCES SUSCEPTIBLE OF SATURATING THE ACIDS.

The first case we will quote was observed in 1825 by M. Correa de Serra. Madame V. J——, sempstress, having swallowed by mistake two ounces of concentrated sulphuric acid, was submitted to a treatment by magnesia; she was saved, but she remained a long time affected by the disastrous consequences of cauterization by the acid.—(*Journal de Chimie Medicale*, t. ii. p. 210.)

The second was remarked by M. Gabriel Pelletan, in 1835. Madame N——, aged 27, wished to poison herself with liquid blue —*a solution of indigo in concentrated sulphuric acid*;—this blue had been diluted with water. Calcined magnesia being administered gave rise to such satisfactory results that the patient was promptly relieved and cured. (*Journal de Chimie Medicale*, tome i. 2d Series, p. 11.

The third was communicated to us by M. Lalande, apothecary at Falaise. M. Fert, dyer, having swallowed by mistake a glass of concentrated sulphuric acid, magnesia was administered; it caused the first symptoms to cease, and the patient was saved. (*Journal de Chimie Médicale*, t. iii. 2nd series, page 439.)

The fourth was observed in 1837 by M. Emery. A young girl was brought to the hospital Saint Louis, Napoleon ward. She was treated by magnesia, and this treatment which gave rise to some purgations, caused the symptoms to cease: the patient left the hospital cured.

The fifth was quite recent. A servant of M. M——— having taken sulphuric acid for wine, drank a certain quantity of it: magnesia was administered to him immediately, and he was, after a little time, in a condition to continue his occupation: however, he still lives only on milk.

POISONING BY NITRIC ACID.

I have had an opportunity of observing two cases of poisoning by nitric acid.

The first in 1820 or 1821, in the Hospital de la Pitié. A young working jeweller was brought to this hospital: he had taken, in consequence of being crossed in love, nearly half a glass of aqua fortis. As soon as he arrived, a dose of calcined magnesia dissolved in water was administered to him. This medication calmed the symptoms, and ten days after the patient left the hospital. This workman retained for a long time a remarkable thinness.

The second in 1828 or 1829. We were informed that a young girl had just, on account of trouble, poisoned herself with nitric acid. We repaired immediately to the patient. There was administered to her almost by force, at least four ounces of calcined magnesia dissolved in water. The symptoms were calmed, and the patient was very promptly re-established; she lives still, for it is not long since we met her.

These facts show, in our opinion, that carbonated magnesia is an antidote for acids, and that it ought to be employed as an antidote in cases of poisoning by the acids.

ARE THE ACIDS ABSORBED IN CASES OF POISONING BY ACIDS?

In searching among the works which we have been enabled to do concerning poisoning by acids, we are in a position to prove that when poisoning by an acid takes place, the acid is not absorbed, and remains upon the tissues; indeed, 1st, the examination of the stomach and intestines from the body of Cuiquin, who died at Montmartre in consequence of the ingestion of sulphuric acid, October 6th, 1835, has demonstrated that these organs contained a great quantity of free sulphuric acid, which had not been absorbed. (*Judicial Report of the* 27*th Oct.* 1835.)

2nd. The examination of the stomach and intestines of M. Doré, who died by poisoning with sulphuric acid, demonstrated that the stomach contained a great quantity of free sulphuric acid which had not been absorbed; and that part of the intestine contained the same acid free. (*Judicial Report of the* 15*th Feb.* 1836.)

3rd. The examination of the stomach and intestines of the body of the girl Adolphine Cauvin, who died on account of having swallowed sulphuric acid, has shown that these organs contained that acid free. (*Judicial Report of the 7th January*, 1838.)

These facts show, in our opinion, that in cases of poisoning by the concentrated acids, the acid is not absorbed, and that there is a necessity, in cases of poisoning by acids, to proceed to the annihilation of these acids by aid of an absorbant substance.

We shall be told, it is true, that in this case it does not act *in a capsule*, *in a retort*, *in an alembic*, (it is the common observation employed by all those who oppose the application of chemistry to medicine), to which we reply:—Poisonings have taken place by quantities of acids which should have caused death, the antidote has been administered, the patient has been saved. What more ought to be expected?

We will here terminate what we have to say on this subject; we shall expect, in order to be convinced that alkalies or alkaline carbonates should not be administered in cases of poisoning by concentrated acids, that there be proved to us by very positive facts, 1st, that the patient can be saved by other methods; 2ndly, that these methods are preferable; 3dly, that acids ingested in the stomach are entirely absorbed, which does not take place if we rely on the examination of the bodies of persons who have died in consequence of poisoning by acids.

THERAPEUTICAL ACTION OF PRUSSIC ACID.*

The following is a summary of M. Becquerel's researches:—

In diseases of the heart the use of prussic acid is more injurious than useful, as it sometimes increases the distressing symptoms.

The anhydrous acid, prepared after the manner of gea-pessina, is the only one which should be employed medicinally: it keeps for a long time without being altered, and its action is uniform.

It should be given in a mixture of four ounces of water without sugar, and by spoonfuls. Uniformity in the strength of the doses is thus obtained.

When given in a dose of from 8 to 12 drops this acid acts locally, and with intermissions; but when carried to 16 or 20 drops, and continued for a certain time, its action is general and not intermittent: it is essentially hyposthenic.

In larger doses than those just mentioned, prussic acid is apt to occasion certain accidents, the chief symptoms of which consist in a violent excitement of the nervous and circulating systems.

It has no influence on the progress or symptoms of any disease; but in some nervous affections it may change the progress, intensity, and nature of the symptoms, without bringing about a complete cure.

POISONING BY METALLIC ARSENIC; CURE BY THE HYDRATE OF PEROXIDE OF IRON.†

BY M. BATILLIET.

The cases of cure of poisoning by arsenical substances, by means of the hydrate of peroxide of iron, not being very numerous, it is useful to notice those which are presented, in order to dissipate the doubt which might still exist. We, therefore, hasten to report the following fact to the society:—

The 4th of last October, MM. S......, father and son, experienced violent vomitings at their supper; it was thought that the cause was found, after perceiving that the bottle, having held the wine which they had consumed, contained a foreign body. This bottle was fortunately brought to us from the country where these gentlemen resided. Before every other investigation, it occurred to us to heat a fragment of this solid body by the blow pipe. This attempt was sufficient for us to recognise immediately that it was arsenic in the metallic state.

We hastened to communicate to the physician, that hydrate of peroxide of iron dried in the open air had been lately tried. A spoonful was administered in sugared water, but that was only effected three hours after the first symptoms of poisoning, on account of the distance. However, at the third dose with one of the persons, and, at the fourth, with the other, the vomitings ceased.

During this time, and with prudence, we hastened to prepare a new quantity of oxide, to be given in the humid state, as that has been most particularly recommended.

In so pressing a case, as we could not follow the ordinary course, to procure this preparation promptly, we thought another ought to be adopted, which we give, because apothecaries may find themselves in our situation.

Some iron filings were put into a large vessel with dilute nitric acid and heated, water was added to the solution, it was decanted to separate the excess of filings, ammonia was poured into it, in slight excess; afterwards, the whole was poured into the vessel; it was again placed on the fire, with the view of driving off part of the excess of alkali and of giving to the precipitate a cohesion which rendered it more easy to wash; it was drawn off clear by aid of a siphon, and finished by washing with warm water: the first having been slightly acidulated by vinegar; it was dried on a cloth.

By operating thus, we were able to dispatch, two hours after, about two quarts of a pap of peroxide of iron, of a good consistence. The physician administered a large dose, although the vomiting had ceased, and towards four o'clock in the morning the patients slept until seven; the remainder of the day was passed without symptoms, and the next day they were able to walk in the country.

After the first symptoms, a member of the family and two servants tasted the wine which remained in the bottle: all three were seized with vomitings; but without subsequent depression, probably on account of the small dose each had taken.

Metallic arsenic is evidently dissolved in passing to the state of arsenious acid; which takes place very promptly by virtue of the rapid oxidability of this body, especially in the presence of so complex and alterable a liquid as wine.

Wishing to ascertain as near as possible the quantity of arsenic which might, in contact with wine, pass to the state of arsenious acid, the bottle was filled in which there yet remained 40 grammes of arsenic. After twenty four hours' maceration, it was filtered, the 808 grammes of the wine which it contained, and which had not contracted any unpleasant taste, was evaporated.

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* *Gaz. Med. de Paris*, Jan. 13, 1840; and *The Lancet*.

† *Journal de Chimie Médicale*, Jan., 1840.

The residue was burnt with a mixture of nitrate of potassa, subcarbonate and muriate of soda ; after deflagration, the salt was dissolved in distilled water and supersaturated by hydrochloric acid, next, submitted to the action of a current of sulphuretted hydrogen ; the next day 1 gramme 329 milligrammes of orange sulphuret of arsenic was gathered, which furnished 1 gramme 265 milligrammes of arsenic, or about 1 gramme 3 decigrammes of arsenious acid.

It is to be supposed that the dose of poison swallowed by MM. S——— was much more considerable ; for, independent of the pulverulent portion carried along with the wine at the moment of pouring it out, its continuance in this bottle had been eight months.

Be it as it may, the dose was sufficient to cause death ; thus, the action of peroxide of iron has been irrevocably efficacious.

From the above, it would appear that the hydrate of peroxide of iron dried in the air, produces as good effects as that which is still humid.

At all events, both ought always to be found in apothecaries' shops ; but, before enclosing the latter in flasks, a portion of it should be dried, and the quantity of dry peroxide which corresponds to the moist should be written on the label of the vessel.

Without this measure, it is evident that it would never be known whether the dose administered to the patient were sufficient.

Too frequently, accidents of this kind are occasioned by the metallic arsenic, which the grocers sell indiscriminately to all who come, under the name of fly's-bane, black lead, and even cobalt.

How does it occur that the law, so precise in its applications, can strike an apothecary so severely, while the irresponsibility of the grocer and the druggist is tolerated in such a matter? The conclusion is natural, it seems that those who distribute justice, do not make an equal division.

ON FERRUGINOUS PREPARATIONS.*

BY M. BERAL.

M. Beral, one of the most distinguished apothecaries in Paris, has just submitted to the view of the Academy his numerous and rich collection of salts of iron ; it is impossible to find preparations of greater beauty, or of more complete purity than those presented by this skilful chemist.

In the letter addressed to the president, M. Beral expresses himself thus, saying that two of the preparations are especially worthy of the attention of the Academy.

" The first of these preparations is a citrate of iron, which I made known eight years ago, but in the preparation of which I have, since that time made signal improvements.

" A summary exposition of the qualities which belong to this ferruginous salt, will be sufficient to predict the advantages which medicine has reason to expect from its use.

" This citrate contains half its weight of peroxide of iron, atmospheric air has no influence over it, its solubility is perfect, and its preservation easy and unlimited. Another quality of this citrate, and which is not less important than the preceding, is that it has not the styptic and atramentary taste which characterizes other ferruginous salts, a taste which much prejudices, as we know, the employment of these medicaments.

" This citrate of iron is obtained under the form of transparent bracteæ of a beautiful garnet colour, by means of a process which I shall have the honour of communicating to the Academy through the medium of the minister of commerce.

" The qualities which practitioners seek in ferruginous bodies are found combined, as we have just seen, in this citrate. It will not, therefore, be surprising to hear, on one part, that employed as a therapeutic agent its action has always been prompt and certain, and that, on the other side, considered with respect to the agreeableness of its use, there does not exist any preparation of iron which can be compared to it.

" The second product, or tartrate of potassa and iron, is a substance very anciently known, but which left much to be desired with respect to its composition.

" This salt, which I present to the Academy under the form of transparent scales, possesses the character of being entirely soluble, of not undergoing any alteration when exposed to atmospheric air, and of having a strong atramentary taste. It may be used externally, and its solution may be substituted with advantage for other medicaments, whose composition is equivocal and action uncertain.

" Next come, under the form of syrup, of saccharure, of lozenges and pills, the pharmaceutical compounds which have the citrate of iron for their basis.

" Moreover will be remarked :—

" 1st. A native peroxide of iron (hæmatite), which of all the native and factitious oxides of iron is the purest, and which, on account of this circumstance, I employ in the preparation of the citrate and other salts of iron :

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* *Academy of Medicine*, Sitting of the 24th December, 1839.

"2nd. Hydrate of peroxide of iron in the state in which it is fit to be employed in cases of poisoning by arsenic :

"3rd. The same hydrate dried, and nevertheless containing a third of its weight of water, which facilitates its absorption :

"4th. Perchloride of iron crystallized by a process which I have already made known ; in this condition the chloride is almost neutral and most easy to proportion :

"5th. Hydrochlorate of ammonia and iron in a state of peroxidation, whose composition is invariable :

"6th. Liquid acetate of iron :

"7th. Pure and crystallized sulphate of iron :

"8th. To conclude, a ferruginous wine of quinquina already known, but of which I have improved the method of preparation, and to which may now be associated citrate of iron in all proportions, without fear of altering its properties. Formed by the union of elements which many people supposed incompatible, the ferruginous wine of quinquina constitutes a medicament the want of which was constantly felt, and which in the hands of physicians, will receive numerous and useful applications.

The Academy adjourned the nomination of a commission to make a report, until it has received from the minister of commerce the communication of the processes employed by M. Beral.*

QUININE AND ITS ADULTERATION.

To the Editor of The Chemist.

Sir,—Convinced that anything which may tend to draw attention, where doubt may exist, as to the purity of a drug, will be received by you with indulgence, we have taken the liberty to offer you these few remarks.

The substance that we wish to bring before you is the Quininæ Disulphas, a salt which has for some time past gained a high and just celebrity, but is now we are afraid falling into disrepute. Our attention to this subject was first attracted, by the complaints of some physicians, regarding the slow and uncertain action of quina. This was most singular, as we have always used Pelletier's or Howard's preparation. But when some of those gentlemen employed the Pulvis Cinchonæ lancifoliæ, with success, in those very cases, in which they had found Disulphate of Quinine to be comparatively inert, we fancied that, even the names of Pelletier and Levaillant were not a sufficient guarantee for its purity. Now, the mode of preparing the Quinine is so simple, that if it were *carefully* followed, a powerful medicine ought to be produced.

That the true Pulvis Cinchonæ is a good medicine cannot be doubted ; but the quantity of extraneous matter, which must be swallowed by the patient, when this substance is employed, is so great that few stomachs can bear it. We may, therefore, mention here a very elegant and at the same time simple method of giving the bark. It consists in making the powder into a paste with water, which of course decreases its bulk : each dose of this Cinchona paste is then to be placed on a piece of wafer paper, previously moistened upon that surface on which the paste is laid, rolled up, and swallowed. In this way the nauseous taste is got rid of, and the sickening doses of so much woody fibre entirely obviated.

We have examined the French and English Quinine, and find, that the former contains 15 per cent. of Sulphate of Lime, mixed with other earthy matter. Howard's preparation appears to us to be the most pure, even when tested according to M. Delondre's method. There is a third kind of Quinine in the London market, called *German*, and said to be procured from the bark of the Æsculus Hippocastanum. This we have not seen ; but from its low price would much fear its adulteration. Some have supposed that unctuous or cerous substances have been used to adulterate Quinine, but we have failed in discovering even traces of Stearine, Margarine, &c. Sugar also appears to be absent from that which we have examined. Might we enquire, whether the principle obtained from the bark of the Saline Helise, discovered by M. Leroux, called Saliniæ, and which bears a correct resemblance to this salt in appearance, does not become a substance by which the Quinine may be adulterated. The Cinchona Bark, being so dear at present, offers great inducement for extensive substitution, where this can be done with safety, and we are well aware how frequently a spurious drug is brought before us. It would appear to us that the quantity of earthy matter, found in the salt, must arise from carelessness in the preparation ; for if lime or potass be used, for the purpose of reducing the super-sulphate to the disulphate of Quinine, the insoluble earthy sulphate thus formed, although only mechanically mixed with the Quina, unless cautiously got rid of, and *pure* alcohol used, are very likely to prove a source of adulteration.

M. and F.

Edinburgh.

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* *Journal des Connaissances Médicales*, January, 1840.

ADULTERATION OF SULPHATE OF QUININE.*

In 1831, volume 17, page 520, of this Repertory, upon the faith of a German journal, M. Vallet noticed the adulteration of sulphate of quinine by mannite, and pointed out for the separation of these two substances the use of absolute alcohol. In one of the last numbers of the *Journal des Connaissances Médicales*, M. Dubail has just mentioned an example of this fraud, which shows with what audacity it is carried on at the present time.

A druggist of Paris having requested him to analyse a sample of sulphate of quinine, he observed that this sulphate, perfectly resembling by its lightness and silky aspect the ordinary sulphate of quinine, presented, however, but a slightly bitter taste and mixed with a sweet after-taste. Treated by distilled water, it was almost entirely dissolved, while alcohol at 40° took up only a sixth of its weight. M. Dubail admitted, after these experiments and some others to which he submitted this mixture, that it was formed of five parts of mannite and one part only of sulphate of quinine.

We can add to this fact that M. Pelletier has recently recognized in the sulphate of quinine, sold under his own seal, a great quantity of plaster.

Our brethren will no doubt conclude with us from these observations, that even the most respectable seal is no guarantee for the purity of sulphate of quinine, since it may be usurped by fraud, and that direct verification is indispensable for this as for all other products which apothecaries send out in commerce.

CHLORIDE OF SODIUM IN SCROFULA.†

M. A. Latour speaks highly of the utility of this remedy in scrofula or pulmonary consumption. The following case is illustrative of its effects:—

A girl, 13 years of age, of lymphatic temperament, suffered, for more than a year, under scrofulous symptoms; the sub-maxillary ganglia were greatly enlarged, and the upper lip was the seat of an extensive scrofulous ulceration, for which a variety of remedies had been tried during eleven months without benefit.

On the 9th of April a drachm of sea-salt was given in soup, and ordered to be continued daily. The sore was washed with salt-water, and the diet was confined entirely to animal food. The re-action produced by the salt was so great that the dose was diminished by one half, and then continued at that dose. The child took frequent exercise in the open air. Towards the middle of May the ulcer was healed, and in fifty days a complete cure was obtained. M. Latour recommends that the salt should be given in flour, made up in the form of a little French roll.

Thus a drachm of salt, dissolved in a small quantity of water, may be mixed with four ounces of flour. Children will readily eat one or two of these rolls in the day.

SYRUP OF IODIDE OF IRON.‡

℞ Pure iodine - - -	20 grammes.
Iron filings - - -	10 grammes.
Distilled water - -	116 grammes.

The mixture is left to digest, the residue is filtered and washed with a little distilled water. The liquors are combined, and 58 grammes of sugar are added; it is evaporated until there remain but 116 grammes of syrup, which may form, with the powder of marshmallow, a good pilular mass, and with water a solution which is preserved limpid. Four parts of this syrup contain one part of iodide of iron. This salt, thus prepared, may be kept for more than three months, without being decomposed, even in contact with the air. Hengel has observed that the syrup is at first brown, but that it does not delay to take a lighter colour, unless it deposits oxide of iron. (*Bachner's Repertory of Pharmacy*, 1839.)

ELATERINE.§

At a meeting of the Westminster Medical Society, Saturday, February 1, 1840, Dr. Golding Bird exhibited a specimen of elaterine, the active principle of elaterium. He remarked on the great variety of opinions and accounts which existed with reference to the effects of elaterium, and attributed this diversity to the mode in which the so-called extract was prepared; its activity, on some occasions, being very much less than on others. For some time past it has been stated, in German and French works on pharmacy, that the active principle of elaterium had been discovered, but no mode for its preparation had been detailed. Two years since he had been favoured with a specimen of elaterine by the Liverpool Apothecaries' Company, who had forwarded it to him in order that he might give it a trial. It was found that the quantity of the alkaloid contained in the various extracts of elaterium differed to a very considerable extent; thus, one specimen yielded 58 per cent of the active principle, while others, apparently as good, yielded only 8 and 10 per cent. He had used the new preparation in several cases in which elaterium would be of service; he had found it produce no vomiting or griping, which was, probably, owing to the absence of the green matter of elaterium. The mode in which he had obtained the preparation before the Society, had been the following:—He boiled a quantity of the green elaterium in spirit, and formed a green tincture; into this he poured some water, in which an alkali had been dissolved; this took up the green matter, and the elaterine was deposited. Elaterine was soluble in warm spirits of wine, or spirits of sweet nitre. The dose of the elaterine was a sixteenth of a grain.*

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* *Journal de Pharmacie*, Jan. 1840.

† *L'Experience*, Jan. 9, 1840; and *The Lancet*.

‡ *Journal de Pharmacie*, January, 1840.

§ From *The Lancet*.

ON THE MANNITE OF THE AGUNCATE TREE.†

BY M. MELSENS.

In an article inserted in the *Journal de Chimie Médicale*, vol. vii. p. 467, M. Avequin, apothecary in the island of Saint Domingo, announced that the seed of the aguncate, the fruit of the aguncate tree, *laurus persea*, contained, besides albumen, oil, &c., a considerable quantity of mannite: twelve pounds of the seed yielded 4 ounces 48 grains. The elementary analysis of this substance (which exhibited all the physical characters of mannite) not having been made, it remained to be proved that it indeed possessed an elementary composition identical with that of the mannite extracted from manna.

With this view, M. Dumas had the kindness to procure me some seed of the aguncate and some mannite from M. Avequin himself. These are the results of an analysis made in his laboratory.

I. 0 gr. 400 of matter gave 0·279 water and 0·577 carbonic acid.

II. 0 gr. 300 of matter gave 0·206 water and 0·431 carbonic acid.

In hundredths:—

	I.	II.
Carbon	39·9	39·8
Hydrogen	7·7	7·6
Oxygen	52·4	52·6
	100·0	100·0

These numbers agree with those of M. Liebig, who found:—carbon 40·0, hydrogen 7·6, oxygen 52·4.

To avoid all difficulty, I sought to extract the mannite from the aguncate seed which I had at my disposal.

In treating 60 grammes of aguncate seed, reduced to a coarse powder, with a third of a quart of boiling alcohol, the filtered liquor, which is of a brownish colour, allows to be deposited, by cooling, mannite crystallized in needles, soiled by oil and brown colouring matter. These being treated a second time by alcohol and animal charcoal, yield mannite of a perfect whiteness. The 60 gr. produced about 1 gr. of matter; the supernatant liquors were thrown away, it being required to prove the presence of mannite and not its quantity. The results of its analysis have always been materially the same.

0 gr. 300 of matter gave 0·309 water and 0·439 carbonic acid.

Or in hundredths:—

Carbon	39·6
Hydrogen	7·7
Oxygen	52·7
	100·0

Thus the mannite of the aguncate seed is identical with that of manna.

PREPARATION OF DECOCT. ALOES COMPOSITA, AND SPIRITUS ÆTHERIS NITRICI.

To the Editor of The Chemist.

SIR,—I would beg to call your attention to the preparation of Decoct. Aloes C. as ordered in the *Pharmacopœia*. So much is lost in allowing it to deposit, that I have taken the liberty of using the *Ext. Aloes. pur.* and *Ext. of Licorice* made by Smith, Fell Street, Wood Street, which is perfectly soluble and a beautiful article; so by using the myrrh bruised, instead of the fine powder, I get very little deposit and an article very far superior to that in general use.

I wish you could call the attention of the Manufacturing Chemist to the mode of preparing the Sp. Æther. Nitrici; for I have found that, in most laboratories, the Spirit and Acid are mixed suddenly together, put into the retort and a strong fire employed to draw it over as quickly as possible. There is consequently driven over a considerable portion of acid, rendering it an article I am sure quite different from what is intended in the *Pharmacopœia*. I have always prepared mine by means of a water-bath, *i. e.* by placing the retort in a water-bath well heated instead of the sand-bath, and then attaching an earthenware worm in a tub, to the bottom of which cold water is constantly flowing.

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* We are informed by Dr. Bird, that the elaterine exhibited was made by Balmer, an operative chemist of Islington, where it may be procured.—REP. LANCET.

† From the *Annales de Chimie et Physique*.

W. Bartlett, *Druggist*, &c.

Chelsea.

ON THE STRENGTH OF HYDROCYANIC ACID.

To the Editor of The Chemist.

Sir,—Permit me to call the attention of your readers, especially such as are Chemists and Druggists, to the strength of the Hydrocyanic Acid of the *London Pharmacopœia*, 1836. Previously to the publication of this edition, hydrocyanic acid was in common use among medical men, though no formula for its preparation had been given, nor had it even been mentioned in the *London Pharmacopœia*. The acid of Scheele's strength has been almost universally used till now: but the acid made according to the *Pharmacopœia* is only *about one-third* of that strength, and as no notice is taken of this difference either in the *Pharmacopœia* itself, or in Phillips's translation, it is probable, (indeed, it *has* been frequently the case,) that they have been supposed to be identical, from which the most fatal results might follow, as the dose of the acid prepared according to the *Pharmacopœia* is three or four times as large as that prepared by Scheele's process. It was the largeness of the dose as indicated in the posological table at the end of Phillips's translation which first attracted my attention: and on inquiry, I have ascertained that the acid there given is only one-third the strength of Scheele's. Hoping that the notice will draw the attention of others to this important subject, I am, &c.

A Chemist and Druggist.

URIC ACID.*

M. Fritzsche has analyzed hydrated crystallized uric acid. When the process given by M. Bœteger of preparing uric acid is adopted, and which consists in dissolving pigeons' dung in a solution of borax, and precipitating the uric acid with hydrochloric acid, the acid is procured in much larger crystals when the solution contains a great quantity of organic matter than when it does not contain any. The separation of the uric acid takes place readily, and but a small quantity remains in the liquor. Even this separates on standing, in the form of yellowish brown dendritic crystals, of a line in length, and are hydrated uric acid. This hydrate, when dried at 212° Fahr., loses about 21·52 per cent. of water. It is only these large crystals which are hydrated; whenever it is precipitated from hot dilute solutions the acid is always of this kind; the smaller the crystals are, the more readily they part with a portion of their water at the usual temperature, and it is on this account that they have been so long unknown.

TO CORRESPONDENTS.

Nota Bene.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London.*"

With the opinions expressed in the letter of Mr. Phillips, of Luton, we in a great measure coincide. "The true chemist," he observes, "the philosophic enquirer into nature, asks no exclusive privileges; he that is now content to devote time, money and often health, to the pursuit of knowledge, wishes not that the law should draw a fence around him; he does it now for the honour due to the votaries of science, for the bright pleasures which the possession of her truths afford him: so should his distinction be an honorary one. Let, however, a school for the study of chemistry and pharmacy, theoretical and practical, as well as those branches of natural philosophy, mineralogy, botany, &c., which are most closely connected with these be formed; let the establishment be placed under proper government, and teachers qualified for the office be appointed; and then let those who choose enter themselves as pupils, paying such charges as may be deemed sufficient—and the charge should be as moderate as possible. At stated times examinations should be held; and such as were found competent would be entitled to receive a diploma of their proficiency. As for the rest, leave the world to judge between the chemist having a thorough knowledge of his profession and the retailer of drugs ignorant of the nature, composition, and powers of the articles which he vends."

The Report of the Price of Drugs has been found inexpedient, as taking the place of more valuable matter, &c. &c.

Mr. Bartlett's proffered communication will be very acceptable.

Mr. Tuff is sincerely thanked for his advice, which will receive serious consideration. The perusal of the document alluded to would be a favour.

A Well-wisher and Subscriber, we trust, now receives "The Chemist" as early as other Periodicals. His valuable suggestion will in due time be acted upon.

Important Communications are of course acceptable; but our space does not admit of Discussions.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

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* *L'Institut*, No. 304.

THE CHEMIST.

I. CHEMISTRY.

ON THE REDUCTION OF GOLD AND SILVER, TO THE METALLIC STATE FROM THEIR SOLUTIONS IN ACIDS.

BY CHARLES WATT.

CHEMISTRY is indebted to the genius and industry of the late Mrs. Fulhame,[*] (distinguished alike for her talents and her misfortunes,) for a few of the most beautiful experiments and accurate deductions which are to be found in that science.

With the view of improving her broken fortunes, she made a series of experiments in order to enable her to cover ribbons and silks with an external coat of gold and silver. The method she pursued was the following.

She first made a solution of gold by dissolving that metal, divided into fine grains, in a compound of one-third nitric and two-thirds muriatic acid, in a glass vessel;[†] she applied a gentle heat thereto until all the gold disappeared, and she afterwards continued the heat to evaporate all the uncombined acid, when the nitro-muriate of gold formed itself into a beautiful mass of yellow crystals, which she redissolved in five or six times their weight of distilled water; and with this solution she prosecuted her experiments.

She dipped pieces of ribbon or silk into the solution; and, while wet, she subjected them to hydrogen gas, phosphuretted hydrogen gas, and also to the fumes of phosphorus and of sulphur, when she found that the gold was almost immediately revived, and gave the surface of the silk the appearance of a beautiful web of burnished gold, which in the sun's rays glittered too much to be viewed without pain. She also exposed them to the action of light and other deoxidising bodies, and with the same results, differing only in their degrees of perfection, according to the power of the agent employed.

The next step was to dissolve the nitro-muriate of gold in alcohol and in sulphuric ether,[‡] as it is said these bodies dissolve the oxides only of these metals, leaving the acid free.

Having dipped, as before, the ribbon or silk into these solutions, she observed, that when she removed them, and while they were wet with the gold in solution, having exposed them to the agents already named, they had no effect in restoring the gold to its metallic state,—she found, in fact, that water, either in the solution of gold, or in the form of steam or vapour, was absolutely necessary for the reduction of the nitro-muriate.

She next tried a solution of the nitrate of silver in precisely the same manner, and with exactly the same results; no reduction taking place, if water, in some form or other, were absent.

Were it necessary that these salts should be in a liquid state, according to the chemical axiom, "corpora non agunt nisi sint soluta," when exposed to deoxidising agents, the reduction ought to have taken place, which was not the case.

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[*] This lady, the widow of a physician, after struggling with great privations and disappointments, died in abject poverty in a mean apartment in the vicinity of Soho Square.

[†] The greatest care should be taken to get the nitro-muriate of gold as free from uncombined acid as possible. It is stated in chemical works that the chromic acid, combined with muriatic acid, will dissolve gold. This, however, it can only do by producing chlorine and chloric acid; and as we have no account of any practical application of this solution, we cannot see how it could be advantageous. Certain it is, however, that if that powerful and highly corrosive agent, nitric acid, could be avoided, it would be very desirable.

[‡] These solvents were employed, I suppose, on account of the solution in water destroying the texture of the silk, and causing it to tear with very little handling.

I proved, indeed, that when exposed even to the powerful agency of the direct rays of the sun, no effect was manifest, where aqueous matter was deficient. I put some crystals of nitro-muriate of gold and nitrate of silver, quite dry, on a clean piece of glass, and then placed it under the exhausted receiver of an air-pump; and, after being kept in the sun's rays for several hours, scarcely any effect took place, and what did occur was clearly to be traced to some water in the receiver.

From such facts as I have related, Mrs. Fulhame drew the conclusion, that in reducing these metallic solutions, water acts by suffering a decomposition; and indeed this seems the only conclusion that can be drawn.

Disappointed at the total failure of her expectations of making ribbons and silks of gold and silver, as for this purpose they could not be perfected, she published her little treatise as the only means of repaying a small part of the expense and labour she had bestowed upon the subject.

Considering it, however, to be one which might be made available for useful purposes, and give origin to new sources of industry and profit, I made many experiments, from which I obtained some interesting results, which may not be unworthy of the attention of our readers.

My solutions were made as already described; the acid being carefully evaporated in the first instance, to ensure there being no excess.

It may here be proper to remark, that in these experiments my object was not to cover silk or ribbon, but such substances as quills or pens; conceiving that there would thence result a twofold effect; first, the protection of the substance from becoming softened by ink; and secondly, the extreme beauty and elegance of its appearance.

The difficulty of applying water and hydrogen at the same time, compelled me to relinquish the former agent, and after resorting to every one known to reduce metallic solutions, I found none to have so powerful an effect as phosphuretted hydrogen gas.

Accordingly, after dipping the quills or pens for about ten minutes in this solution of gold, I exposed them to the action of this gas; but here another difficulty presented itself, and that was, that the gas acted so powerfully that some portions of the gold were reduced to the metallic state, while others were changed to all varieties of colour by combining with portions of the phosphuretted hydrogen.

Hence I was led to try that compound of phosphorus and hydrogen which contains less phosphorus, and which was first prepared, I believe, by Gingembre, by boiling in a retort or other vessel a strong solution of caustic potash with phosphorus.

Having prepared this solution, I exposed the quills or pens previously dipped in the solution of gold, and I then found that the metal soon became reduced, and with all its accustomed brilliancy. Still, however, the effect was slow, and the surface of gold was exceedingly thin and transparent, in consequence of all the gold not being revived.

I therefore made various experiments in order to produce a more perfect reduction of the metal. From the very powerful affinity which the sulphurous acid gas is known to have for oxygen, I made many trials of it, but found invariably, that instead of reducing the gold on the quills in the form of a fine metallic covering, it converted it into the state of a brown powder more like a precipitate, which was wiped off on the slightest touch: still, however, the gold was perfectly reduced.

Conceiving that the defect here was not of a chemical, but mechanical nature, and that it depended on a want, if I may so express it, of an adaptation of surface in the substance of the quills, I adopted the following process, which I at once found to remove all the difficulties I had encountered.

Having dipped the quills into the solution, and removed them, I let them remain for about twenty minutes in the air till they became perfectly dry; then I exposed them in glass vessels to the fumes of this gas,* until a fine scale of gold had been reduced over all the surface which had been dipped in the solution. When this was done, I removed the quills or pens into a vessel containing a strong solution in water of sulphurous acid gas, keeping them suspended so that they should not touch the solution, but only be subjected to its fumes. The effect now became striking and rapid, and in a very few minutes the covering of gold was so thick as to render the quills or pens perfectly opaque. Seeing my object nearly obtained, I took out the quills or pens, and rinsed them carefully in soft water to remove the sulphuric acid formed on the surface, and thus to prevent it from corroding their substance or injuring the solution of gold when they were again immersed in it.

I repeated the operations of dipping them into the solution of gold, and reviving it as many times as I thought proper, and indeed until I have often covered the pens with a coat of burnished gold of surprising thickness and beauty.

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* It may here be necessary to observe, that at the temperature of between 60° and 70° not only sufficient gas, but likewise aqueous vapour also, was produced, as Mrs. Fulhame had shewn to be absolutely required.

It is a very singular fact, and one which can be referred only to mechanical causes, that, excepting in the revival of the gold, after the first dipping, the exposure of them to the action of the phosphuretted hydrogen gas was never required for subsequent revivals.

The last part of the process was to rinse the pens in water, dry them, and then polish them with a little whitening and wash-leather, when their appearance was very highly beautiful.

Considering the quills or pens merely as means of holding the solution on their surfaces, I felt convinced that upon any other substances the same results would take place, and accordingly I found that, when put upon glass,* precisely the same train of effects ensued, and that the first revival was not effected unless it was first exposed to phosphuretted hydrogen gas.

Seeing the effects of these two agents, viz., phosphuretted hydrogen gas and sulphurous acid gas in reviving gold, I was induced to try them when the solution was put upon such surfaces as silk, and here I found a very striking result. If, for instance, I dipped a piece of ribbon in the solution, and, while wet, exposed it to the sulphurous acid fumes, the same light powder of gold already mentioned took place; but if, on the contrary, the silk was previously immersed for a single instant in the fumes of phosphuretted hydrogen, and then removed suddenly into those of sulphurous acid, the whole of the dipped portion was immediately converted into a thin sheet of gold of the highest polish and lustre.†

In the course of these experiments, I found that precisely the same effects took place if, after being dipped in the solution of gold, and before immersion into the sulphurous acid gas, the substances covered with the solution were exposed for a very short time to other deoxidising agents, as light, hydrogen, or the fumes of phosphorus.

Induced by the results I have described, to extend my experiments to other substances, I subjected furs and feathers to the same processes; but I very soon found that in those delicate substances, I could not employ sulphurous acid gas; first, because it so soon wetted the whole fabric, and clogged it together, and more especially because it so rapidly became converted into sulphuric acid, and destroyed the texture of those substances.

I therefore was compelled to rely totally upon the phosphuretted hydrogen gas; and, by this agent alone, and making two or three dippings in the solution and subsequent revivings, I have been enabled to cover the delicate fibres of the ostrich feather, and even a spider's web, with a beautiful film of gold.‡

Of the revival of Silver from its solution.—It is well known that the chief and common solvent of this metal is nitric acid, which dissolves about half its weight of the metal.

In making a solution for the purposes which have been described in speaking of gold, the same, and even greater caution is necessary to evaporate all this acid (as it is by far more destructive of animal substances than the solvent of gold); and, when all the acid is expelled, and the mass crystallized, I have found it advisable to continue the heat a few minutes longer, in order to ensure no risk of uncombined acid remaining.

It is now to be re-dissolved in about eight or ten times its weight of distilled water or even more;§ and it is then in a fit state for the experiments.

I found, first, that in covering animal substances with silver, it was essential to clean them well before dipping them into the solution, in consequence of a kind of scurf being sometimes attached to them, which, in the process of silvering, comes off, and with it, the coat of metal, giving the substances an uneven and irregular appearance.

When thus prepared, I have generally dipt them in the solution until they became of a light yellow colour, or for about ten minutes; and I have then taken them out and let them dry in the air.

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* It does not seem improbable that a golden surface might, by some change and modification of process, be made the subject of the Daguerréotype.

† This effect is produced partly by the thin scale of gold first formed by the action of the phosphuretted hydrogen gas; but the suddenness of effect is especially due to the sulphurous acid gas, which by holding more aqueous vapour than the other gas, acts under more favourable circumstances.

‡ I found, in gilding this delicate substance, that the solution of gold ought to be diluted with at least eight times its weight of water.—After many trials, I was convinced that the essential oil of lavender was the best solvent; as the feather was less injured in texture, and not so much clogged.

§ Distilled water is particularly necessary, as all water contains some portion of salts which render the solution turbid, and injures its chemical action.

As those I chiefly made the subjects of experiment, were quills and pens, I shall here describe the process and its results.

When I first subjected these substances to the process of reviving, I found that extreme difficulty opposed itself to my success. I tried the sub-phosphuretted hydrogen, which I prepared in the following manner.

I dissolved about half an ounce of pure potash in an ounce and a half of water, and I then put in about one drachm of phosphorus, and applied a gentle heat till the phosphorus fused. I then shook the bottle containing it so as to divide the phosphorus into small grains, and then put it in a cold place in order to allow the phosphorus to become solid. This being done, I subjected the quills or pens, previously dipped and dried, to the fumes given off by the phosphorus. The silver soon appeared, indeed; yet it never became of pure metallic lustre, but, after evincing a certain degree of reduction, it assumed various colours, from dark blue to brown, owing to the combination of a portion of phosphuretted hydrogen.

This occurred so regularly in every experiment, that I was obliged altogether to abandon its use as totally unadapted to the purpose.—Still less so is the sulphurous acid; as it combines with the nitrate, converting it into sulphate, and thus preventing the reduction of the metal.

Finding neither of these agents suitable for the purpose, and as the phosphuretted hydrogen seemed to act too powerfully, I resolved upon trying phosphorus alone; and in doing this, I adopted the following method, which proved completely successful.

I took about a drachm of phosphorus and put it into a bottle containing as much water as would cover it, and then held the bottle over a lighted candle, and gradually and carefully heated it till the phosphorus fused, when I shook it gently, in order to break the phosphorus into small pieces.* This being done, I set the bottle in a cool place to cause them to become solid.

The next part of the process I conducted thus:—Having dipped the quills or pens into the solution of nitrate of silver for ten minutes, as already described, and afterwards allowed them time to dry, I then carefully drained the water out of the bottle containing the pieces of phosphorus, until there remained sufficient water only to cover the divided phosphorus about half way, leaving the other half exposed to the air. I then suspended the dipped quills or pens in the fumes of phosphorus, copiously generated and accompanied with aqueous vapour, sufficient, as I concluded, for the purpose of the reduction of the silver.

Some time elapsed before a perfect specimen of reduced silver was obtained. Not feeling, however, any fear of ultimate success, I allowed them to remain in the fumes of phosphorus for two or more hours, when I found that the reduction became complete. The first indication of the perfect reduction of the silver which came under my observation, was just at the points or nibs of the quills or pens, which were of the bright colour, and when polished, possessed all the lustre and brilliancy of that metal.

Upon further examination and observation of the changes from time to time, going on in the reduction of this metal from its solution, when the quills were suspended in the fumes of phosphorus, I found that the dark blue colour which was first produced, and which was caused by the metal being in a state of oxide, gradually became less and less; first, at all the points and angles of the quills, and progressively further and further on towards the centre, till, at length, it wholly disappeared, and the silver, in all its pure delicate whiteness, was perfectly reduced.

These quills were rinsed in water, and again dipped in the solution of silver, and subjected to a second reduction with precisely the same results; and the respective processes were alternately repeated till a beautiful and substantial coat of silver was given to them.

The foregoing experiments were afterwards made on pieces of glass, and with results perfectly the same as when made with quills, or other animal substances.

It is quite clear, from the foregoing experiments, that water is indispensable to the reduction, in the humid way, of metals from their solutions; and that the great art in reducing them consists in the employment of such a deoxidizing agent as does not combine with and tarnish them.

In conclusion, with respect to the reduction of silver, I have found that the method I have here detailed is the only one which can lay any claim to certainty or perfection, and the only one which holds out any prospect of ever being brought to practical utility in the arts.

ON THE PRECIPITATION OF GOLD.*

BY M. A. MORIN.

Whenever gold is dissolved, with a view

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* If, in shaking the bottle, any of the phosphorus ignites, it is necessary to have a bottle of cold water at hand, and to pour some of the cold water into the phosphorus bottle to extinguish the ignition.

* *Journal de Pharmacie*, February, 1840.

of making some preparation of that metal, or to refine the surface of jewels to give it its colour, a more or less considerable portion of it remains in the mother liquor. Various processes of extracting it have been recommended. They are founded on the property possessed by many substances of mineral or organic nature, of precipitating gold from its solutions in the metallic state.

The principal substances used with this view are sulphate of iron, very long since employed, and formic acid, or the formiates of potassa and soda, which the most esteemed scientific repertories have lately praised as an excellent means of reviving efficiently, and at small cost, the small quantities of gold retained in a liquid.

Although sulphate of iron is very cheap, compared with the formiates or formic acid, the value of the metal for the extraction of which these substances are employed is such, that one should not, perhaps, hesitate to use the most expensive, if it afforded the means of extracting the gold more perfectly. It might therefore be interesting in every laboratory, or every art having occasion to make solutions of gold, to know the comparative value of the two processes most generally recommended for its precipitation. I have endeavoured to resolve this question by making use, with this view, of the mother liquors which resulted from some preparations of this metal.

They were divided into equal parts, each weighing a kilogramme, and as each part contained rather more than two grammes of gold, they represented a solution of this metal at $\frac{1}{450}$.

Into one I poured concentrated formic acid until it acquired a decided acidity. Its colour became of a fine deep yellow. It did not precipitate gold, even when heated. Formiate of potassa, tried with a small quantity of this liquid diluted, did not manifest any reaction. It was only when it had been evaporated to half, that metallic bracteæ appeared on the surface.

The addition of a few drops of caustic potassa much increased the production of it, which determined me to add it as long as it caused any precipitate. The latter had the appearance of blackish flakes mixed with metallic bracteæ. It was deposited very promptly. The liquid was neutral and of a green colour. A few drops of caustic potassa did not cause any more precipitate, and a slight excess of formic acid produced no other effect than that of turning the liquid to a deep brown. A new concentration of the liquid did not cause any farther separation of metal. The precipitate, washed and dried, was black. Heated to redness, it took the lustre proper to gold. Its weight was about 1·535 gr.

The washing water and mother liquor reunited, were then mixed with a solution of sulphate of iron. It formed an abundant black precipitate by muriatic acid with heat. It became very clear light brown. By adding to it more sulphate of iron, metallic bracteæ were formed. I continued the addition of this salt until nothing more was precipitated. The deposit washed with warm water, then with acid, was dried, and turned red. It had a metallic lustre. Its weight was raised to 0·717 gr., nearly half of the preceding. This quantity of gold added to the preceding gave a total weight of 2·252 gr. This experiment might be sufficient to show the superiority of sulphate of iron over formic acid and formiate of potassa for precipitating gold from its solution. I tried, in the meanwhile, the direct action of sulphate of iron on the other part of the liquid, acidulating it at first with muriatic acid, and heating it. I added sulphate of iron as long as it occasioned any precipitate. Violet at first, it passed afterwards to a clear brown. I separated the precipitate from the supernatant liquid, washed it with water and muriatic acid, dried it, and made it turn red. It weighed 2·280 gr. a quantity nearly equal to that of the two other precipitates.

The mother waters and the water of washing being united, were treated by formiates of potassa, which did not occasion any precipitate, even by concentrating the liquid much by evaporation.

These experiments show:—

1st. That formic acid only precipitates a solution of gold when it is evaporated so as to contain at least $\frac{1}{225}$ of gold.

2nd. That formiate of potassa produces this effect much better than formic acid alone.

3rd. That the formiate of potassa separates from a concentrated solution of gold only about two-thirds of the quantity of gold contained in it.

4th. That sulphate of iron precipitates it completely from liquids which contain only $\frac{1}{450}$ of gold.

The precipitation of gold by sulphate of iron is therefore much more advantageous than that by the formiate of potassa. It is complete, easier, and much more economical. However, two precautions are necessary to render this operation successful: the employment of heat, and a notable addition of muriatic acid.

Heat gives the precipitate a state of cohesion which facilitates the separation. The acid accelerates the action of the sulphate of iron.

The operation is thus concluded in a few minutes.

ON THE PILE KNOWN BY THE NAME OF BECQUEREL'S PILE.*

EXTRACT OF A LETTER FROM M. F. C. HENRICI to M. POGGENDORF.

In order that our readers acquainted with the question may readily comprehend the letter of M. Henrici, we will remind them that Becquerel's pile, reduced to its simplest pressure, is essentially composed of two small glass matrasses, one of which contains nitric acid, and the other a solution of caustic potassa. The acid and the alkali should both be very concentrated. The two matrasses communicate together by means of a bent tube filled with very fine argil, moistened with a solution of sea-salt. Into the matrass containing the acid plunge a sheet of platinum, into the other a sheet of platinum or gold. If the two sheets be put in communication with the multiplier by means of a wire of gold or platinum, a very energetic current is produced; the sheet of gold, or the first sheet of platinum carries negative electricity to the alkali, the second sheet of platinum positive electricity to the acid. Whence comes this current? Does it arise, as M. Becquerel thinks, from the reaction of the acid on the water, the sea-salt and potassa, or, as M. Fechner and other natural philosophers think, from the contact of the metals with the acid or the alkali? It is a serious and difficult question, the solution of which would be replete with happy consequences. We will now quote the opinion of M. Henrici, who thinks he has completely enlightened this theory. Competent men will judge whether he is not deceived.

Hierz, near Gottingen, June 23, 1839.

" I hasten to send you the description of some experiments, which appear to me to remove all doubt concerning the so much debated question of the origin of the electric current in Becquerel's pile. Being convinced by numerous electroscopic experiments of these two facts :—1st, that the contact of a great number of fluids with the metals, with platinum for example, causes a very intense development of electricity; 2nd, that the contact of two heterogeneous fluids, and even of two fluids which exercise upon one another a chemical action, produces a very weak current;—I was led to call in question the explanation given by M. Becquerel of the curious phenomena observed in his pile, although this explanation had been admitted by other natural philosophers, and to seek a means of uniting the two fluids by a conducting body, which renders any mutual chemical reaction impossible. I attained my object immediately by the following process; into two little cups containing, one a dilute solution of nitric acid, the other a dilute solution of caustic alkali, I plunged the two platinum extremities of my conductor; afterwards I put the two fluids in communication by two of my fingers that I had washed in pure water, and the needle immediately deviated powerfully, and the sense of this deviation was what it would have been if the two fluids had been in immediate contact, for it indicated that positive electricity had passed from the acid into the wire of the multiplier; this effect was reproduced as often as after having withdrawn my fingers from the liquid I dipped them into it again. It is evident that the electric current developed in this circumstance cannot be attributed to a chemical action.

" I afterwards filled a U tube with pure water, the conducting power of which I increased by the addition of a few drops of salt water, and I stopped up the extremities of the tube with corks of elder pith. The tube was then inverted, and one of its extremities was plunged into a glass containing nitric acid, the other into one filled with a solution of caustic alkali; the two liquids were thus separated from one another, so that at first they could not exert any mutual chemical action; but, however, at the moment when the two liquids were in communication, with the assistance of the platinum wire, with the extremities of the multiplier, the needle was briskly moved, and the deviation was 52°. Some bubbles of gas appeared on the wire which was plunged in the alkaline solution.

" This experiment concluded, I withdrew the platinum wire which was plunged into nitric acid, and after having wiped it, I ran it through a cork of elder pith into a tube filled with a solution of caustic alkali, one extremity of which was steeped in a vessel containing nitric acid; this platinum wire was again immediately put in communication with the galvanometer. At the moment when the acid and alkali are joined in the interior of the cork of elder-pith, the needle of the multiplier deviated from three to four degrees, and was fixed at half a degree from its ordinary position; moreover, the sense of the deviation indicated that the current was in a contrary sense to that which I had observed in the preceding experiments. It must again be observed that I had arranged in such a manner that the chemical combination between the acid and the alkali took place while the two platinum wires were plunged in an alkaline solution. From these facts I conclude:

" 1st. That in Becquerel's pile the current results, for the most part, on one hand, from the contact of the platinum with the acid, and on the other, from that of the platinum with the alkali.

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* L'Institut. No. 317, Jan. 23, 1840.

"2nd. That the contact of the acid with the alkali gives rise, at the same time, to another current, sometimes of the same sense as the first, but whose intensity is not indeed the hundredth part of the intensity of the whole current of the pile.

"3rd. That the first of these currents may be merely an effect of contact, and that consequently the contact of heterogeneous conducting bodies is, independently of all chemical action, the true source of the electric current; the chemical action entering into the production of this only in a very trifling quantity. These conclusions find a decisive confirmation in the fact that platinum manifests a positive electric tension, if it is in contact with an acid, and a negative electric tension if it touches an alkali.

"By substituting, in the preceding experiments, for the acid and alkali two saline solutions which determine for platinum contrary electric states, or even only electric states of unequal intensity, and which, moreover, by their contact give rise to a phenomenon which indicates the first moment of their reunion; the truth of my conclusions will be ascertained in the most complete manner. I point out the nitrate of mercury and the iodide of calcium as two liquids which are perfectly fit for these experiments. In one of my experiments the principal current produced by the positive electricity which the platinum takes in contact with one of these liquids, and the negative electricity with which this same metal is charged in its contact with the second liquid, made the needle of my galvanometer deviate about 9° and in a durable manner, while the current resulting from the action of the two liquids caused this same needle scarcely to oscillate round the point 0; these little oscillations seemed to indicate a current of a contrary sense to the first. I have not even been able to put in evidence in a certain manner the electrical tension which would result from the contact of these two liquids by employing a condensing electroscope of extreme sensibility."

Observation. The experiments of M. Henrici then seem to him entirely decisive, even in favour of the theory of contact which has always found in Germany numerous and skilful defenders, but which, submitted in France to more delicate tests, would be now almost forgotten without the new labours of M. Péclet. It is ardently to be desired that M. Becquerel or M. Peltier would show the error of the experiments of the learned German. Would it be possible that, concerning a fundamental question, and the solution of which does not seem beyond the present resources of science, superior minds should remain any longer in opposition without being able to come to an understanding even concerning facts. (*Annalen der Physik und Chemie*, 1839, No. 10, p. 272, *et seq.*)

PHENOMENA OBSERVED CONCERNING CARBONIC ACID SUBMITTED TO PRESSURES HIGHER THAN THAT OF THE ATMOSPHERE.

BY M. COUERBE.

Water, at the ordinary temperature and pressure, dissolves nearly its own volume of carbonic acid gas; but if the pressure be increased, we observed that it absorbs nearly a volume of this gas for every pressure: so that the number of volumes dissolved may be known by means of a manometer put in relation with the interior of the vessel. However, this law does not refer to all pressures; and at 5 volumes the pressure often indicates 7, the temperature being at + 15°. There should, indeed, arrive a crisis at which the liquid should lose its solvent power, and the gas should be near liquefying.

Consequently, the gas compressed in a liquid produces various pressures which do not always correspond to the number of the volumes dissolved. Besides, the nature of the liquid should make the results vary.

The experiments which I have made in order to have a view of the phenomenon, were performed in bottles of Champagne, in good condition, supporting 20 atmospheres; this result should present great securities against breaking: nevertheless, when the fermentation of the wine was continued, we were struck with the breaking which occurred at the end of a month, and which is raised, with some merchants of Champagne, to 15, 20, 30, 40 often 50, and even 60 per. cent. Let a manometer be placed on the bottles which resist; it will indicate, at most, 7 atmospheres. The breaking must therefore be owing to some other cause than pressure; or the tension of the gas, for reasons which I am about to explain, must suddenly augment and exceed 20 atmospheres, the force of the adhesion of the glass.

Observation has shown me that, in this liquid, the interior tension is very strong when it contains rather more than 5 volumes of carbonic acid gas; that it is still great when it contains from 3 to 4 volumes, and that between 4 and 5 volumes it never breaks the bottles. The manometer indicates 7 atmospheres.

The singular cause of such a phenomenon, it appears to me, should be attributed to the solvent power of the liquid for the gas which varies with every pressure. The tension will be so much the weaker as the affinity of the water for the gas is greater.

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* *Journal de Pharmacie*, February, 1840.

Consequently, in a mixture of liquid and the compressed gas, there are manifested two opposite forces—the force of solution, or of affinity of the liquid for the gas, and the force of tension. From 3 to 4 volumes dissolved, the force of solution is weak and cannot conquer the force of the tension of the gas; from 4 to 5 volumes, the pressure is sufficient to render, at its maximum, the affinity of the liquid for the gas, and to give the latter a tension equal only to 7. From 5 volumes and upwards, the dissolving power diminishes; then the tension increases, exceeds the adhesion of the glass which is equal to 20 atmospheres, and breaks it. These results, apparently unaccountable, seem foreign to all that we know concerning the solution of gases in liquids.

However, it is well to mind what M. Soubeiran, in his work on the acidulated gaseous waters, says: "One fact worthy of remark is, that notwithstanding the bad quality of the products, the gas contained in the bottles was sufficient to force out the corks at the end of the experiment; but, however, when the liquid came to be examined, but a small quantity of carbonic acid was found in it." According to M. Soubeiran, this fact is an anomaly, and he seeks to explain it by saying, "The operator, by dexterity, might have confined a portion of gas in the neck of the bottle; it might have accumulated there in an atmosphere sufficiently compressed to force the cork out; but there was not any coincidence between the volume of the gas retained in the water and that of its superior atmosphere."

These different phenomena, such as I have presented above, find examples of another nature, and which may be assimilated to them: these are the solutions of salts in water. It is known, indeed, that sulphate of soda is more soluble at 40° than at 20°, or 60°, &c. On this same subject, on a graphic drawing, may be traced a line passing by points of the drawing which indicate the quantity of salt dissolved and the temperature. It is what is called in chemistry a curve of solubility. In this manner, by applying these ideas to the phenomena which we have just explained, I think that by the aid of continued experiments a curve of solubility of gases in liquids at such and such a pressure might be established, and that these varied and apparently contradictory facts might be made to enter into general laws. Thus, pressure on the solution of carbonic acid gas in certain liquids acts absolutely as heat does on the solution of salts in water, and this resemblance seems to me to be demonstrated in the experiments just described.

In the work quoted, M. Soubeiran gives a table of the experiments which tend to show that agitation contributes to increase the tension of the gas; the difference is particularly distinct at the commencement of the operation. "It results," says the author, "that agitation of the liquid has constantly had the effect augmenting the pressure of the gas on the surface, and of making the water lose a portion of the gas which it contained in solution." On this subject, I will say that I have made more than 50 experiments on bottles of Champagne with 5 volumes, and that the manometer, which indicated 7 atmospheres, has not varied half a millimetre, whence it must be concluded, if the observation of M. Soubeiran is correct, that the empty space causes the phenomenon to vary in measure as it varies in size. I say the empty space, because the experiments of M. Soubeiran were made on a cask of the capacity of 115 quarts of water, charged with 4 volumes of carbonic acid gas, leaving a vacuum of 10 quarts on the surface.

In general, when a liquid, like water, contains several volumes of carbonic acid by the effect of a pressure superior to that of the atmosphere, and when that high pressure is removed, the gas escapes instantaneously, and the liquid retains about 1 volume of it; but champagne acts differently; at the moment of the removal of the cork, half a volume of gas escapes; the disengagement continues to 1 volume, when it stops: thus, a bottle may be left a long time uncorked, without the whole of the gas being driven out of the liquid. I am here supposing that we are acting on a well prepared wine, little dried by tannin. This singular fact is owing to an organic matter extended in the whole mass of wine, which absolutely condenses and retains the gas as do certain powders and a great number of porous bodies, even at the ordinary pressure of the atmosphere. —From the *Actes de l'Academie Royale des Sciences de Bourdeaux*, 1*re année*, page 441, 1839.

ON THE TRANSFORMATION OF CALOMEL INTO CORROSIVE SUBLIMATE.*

BY M. MIALHE.

I am about to communicate to the Society of Pharmacy, the summary of some experiments which I have made concerning the transformation of calomel into corrosive sublimate, and which I am momentarily obliged to interrupt.

The following fact, related by Vogel, prompted me to these investigations. A physician having prescribed for a child twelve packets, each containing five grains of sal ammoniac, five grains of sugar, and one grain and a half of calomel, and the child dying after taking several of these powders, the apothecary was accused of having committed an error in the execution of the order. Happily for our colleague, the accusation against him was of short duration, Peter Koffer having hastened to show that in presence of sal ammoniac and water, calomel is changed into corrosive sublimate. This fact, which I have related in my thesis on aggregation, after having tested its accuracy, has always appeared to me very remarkable, and worthy of fixing the attention of physicians and physiologists. It would not be thus, if the assertion of one of the most distinguished chemists of our school were well founded. This professor assures us, that he has proved, by way of experiment, that the chemical transformation of the protochloride of mercury into the deuto-chloride does not take place under the circumstances described by the German chemist. I will not seek to shew what may be the source of the error into which our learned colleague appears to me to have fallen; I will content myself with publishing here the conclusions which flow from my experiments.

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* *Journal de Pharmacie*, February, 1840.

1st. The protochloride of mercury, in presence of hydrochlorate of ammonia, or the chlorides of sodium and potassium, and pure distilled water, is transformed partly into the deutochloride, and into metallic mercury. This transformation takes place at the temperature of the human body, and even at the ordinary temperature, and requires only a few moments contact to be effected. It is sufficient to convince one of this fact, to let calomel remain a few moments in the mouth; a very strong mercurial taste does not fail to be perceived: this taste results from the mutual reaction of the chloride of mercury and the alkaline chlorides contained in the saliva.

2d. It is to the transformation of calomel into corrosive sublimate and metallic mercury, under the influence of sea-salt and sal ammoniac, which are known to exist in the fluids of the digestive tube, that we must attribute the pathological phenomena of mercurial salivation by the ingestion of calomel. What proves that it is really so, is the clinical observation that, when the protochloride does not purge, but is retained for a long time in the digestive passages, it excites, in this case, an anormal excretion of the salivary glands, and that because a greater quantity of corrosive sublimate then results. The same phenomenon also occurs when the use of protochloride of mercury is continued for a long time, and from the same cause.

3d. As there can only ever be formed a quantity of corrosive sublimate corresponding to the quantity of alkaline chlorides which our viscera contain, great eaters of common salt, everything else being equal, should be the most liable to be salivated under the influence of calomel.

4th. The antisyphilitic properties of calomel are probably communicated to it, entirely or in part, by the sublimate and mercury resulting from its chemical decomposition. It is doubtless the same with its anthelmintic virtues; it is by causing the poisoning of the ascarides that the chloride of mercury delivers us from these troublesome hosts.

5th. All that has just been said concerning the medical action of calomel, may be applied to the protiodide of mercury, which, under the same circumstances, is transformed into the deutiodide.

ON THE PREPARATION OF SULPHATE OF IRON.*

BY M. FELIX BOUDET.

The preparations of iron have performed, in therapeutics, for some years, so important a part, that chemists ought necessarily to devote themselves to giving a new degree of perfection to the processes for obtaining sulphate of iron, from which these preparations are almost all derived.

Bonsdorff first, and since, M. Berthemot, have, indeed, described two particular processes, which yielded this salt in a state of purity which was perfectly satisfactory. The only censure they can incur, is that of leading by complicated or expensive manipulations, to results which may be attained by following a simpler method.

It is known that Bonsdorff recommends iron filings to be dissolved in weak sulphuric acid, assisted by a gentle heat; to pour the liquid into a long-necked glass matrass; to add an excess of filings; to boil the solution, and afterwards filter it over a capsule of glass, into which has previously been poured and stirred in every direction, a small quantity of sulphuric acid.

M. Berthemot, directed by laudable views of the strictest accuracy, dissolves purified sulphate of iron in boiling distilled water, adds an excess of iron filings to the solution, and filters it in a vessel in which he had previously placed a sufficient quantity of alcohol, in order to precipitate the sulphate of iron. The product thus obtained is pure, without doubt, but its pulverulent state facilitates its oxidation; besides, this process entails considerable expences to which, if it were necessary, apothecaries must submit, but which may be avoided without inconvenience, by operating according to the following method :—

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* *Journal de Pharmacie*, February, 1840.

♃ Water	1000 grammes.
Sulphuric acid at 66°	330 grammes.
That is to say, sulphuric acid at 20° . . .	1330 grammes.
Pure iron filings, or turnings	200 grammes.

Place the acid in an earthen vessel; add the filings to it by degrees; stir sometimes, and when the effervescence has stopped, pour the whole into a boiler of brass; boil rapidly until the liquid marks 35° of the areometer; pour immediately on filters lightly impregnated with water acidulated with sulphuric acid, and collect in an earthen vessel, into which you have previously poured 12 grammes of sulphuric acid diluted with an equal part of distilled water; stir the solution gently to mix it with the acid, and let it crystallize; the crystals drained at first on the glass filters and dried afterwards with caution and rapidity, should be enclosed in very dry matrasses. This process, of so easy execution, and which is no other than that of the last codex, modified by the addition of sulphuric acid, the idea of which belongs to Bonsdorff, gives crystals of so clear a blue, that they appear almost white, especially when they are of small dimensions, and which may be kept for a very long time with this same colour, which is the best criterion of the purity of sulphate iron.

NEW MODE OF PREPARING CHLORATE OF POTASSA.*

BY M. PELOUZE.

M. Pelouze has communicated to the Philomatic Society of Paris a new and improved process for the manufacture of chlorate of potassa. Until now, carbonate of potassa has been decomposed by chlorine; M. Pelouze having noticed the inconveniences of this process, proposes to remedy it by substituting soda for potassa. If a proper method be adopted, sea-salt and chlorate of soda are obtained; and afterwards, by double decomposition, the latter is formed into chlorate of potassa, in treating it with one of the cheapest salts of the potassa of commerce. M. Pelouze pointed out a second process, which might be employed with advantage in the same manufacture: it consists in passing chlorine into milk of lime; chloride of lime is then formed, which is afterwards boiled for a long time with muriate of potassa.

ON THE RED COLORATION OF ROCK-SALTS.*

BY M. MARCEL DE SERRES.

The author suspecting that the cause which colored certain rock-salts red might be the same as that which reddens the waters of salt marshes, undertook some investigations on this subject, in concert with M. Joly, who was already occupied with the latter phenomenon.†

Having put under the object glass of a microscope a small portion of rock-salt with a drop of water, the salt was seen to dissolve, and the solid part which remained presented itself in little reddish grains, whose form much resembled that which the animalculæ of the waters of salt marshes take after death. In submitting to the same test colorless rock salt, there was discovered in it, but in less abundance, the remains of the same species of animalculæ (*Monas Dunalii*, according to M. Joly), but in neither have they found any traces of the *Artemia salina.*

Colored rock-salts, from many different localities, were afterwards examined. They were dissolved in distilled water, and by filtering, a residue entirely composed of bodies of organic origin was obtained; some spherical (the animalculæ); others very long, like *Bacillaria;* and others red like the first, but flattened and of a polygonal form, which might be considered as silicious carapaces having belonged to animalculæ.

This residue, exposed to heat, was not very sensibly discolored; but what indicated its animal nature, was the empyreumatic odour which was disengaged and the action of these emanations on reddened turnsole paper, which they in a perceptible manner returned to blue.

However, adds M. Marcel de Serres, I ought not to disguise that a sample of rock-salt which we have sent to M. Berard to analyse, is blackened when exposed to a high temperature, and that, although an empyreumatic smell is perceptible, the reddened turnsole paper has not been returned to blue, which indicates, in this sample, a greater proportion of vegetable substances than of animalculæ.

ON THE ESSENTIAL OIL OF MUSTARD.‡

BY MM. ROBIQUET AND BUSSY.

Organic chemistry offers at the present time a crowd of remarkable products, which deserve, in the highest degree, to attract attention; but there are few among them more interesting than the essential oil of mustard. Indeed, every thing is remarkable in this singular product. Most essences are contained in peculiar organs, and we are informed of their presence by the more or less agreeable aroma with which they pervade the air. Here is nothing of the kind: the seed which yields us this keen and penetrating essence exerts no action on the smell. Moreover, it does not pre-exist, and we are now able to prevent or cause its production; and while other essences admit but few elements into their composition, which is even confined to two, this reckons more than four, and in this number azote and sulphur are met with. It is the only instance we have of the presence of the latter in an essential oil. It may be conceived, that, if ordinary organic products have so often been able to puzzle all provisions, or to escape the various theories which they give rise to, this more complex one will still long elude all our efforts, at least in a collective and general point of view; and it will be by much extending our observations alone, that we can hope to open a road into this new labyrinth. We must not then be surprised to see this substance studied by several chemists successively. It is also certain that there are good and useful observations to be made by all, and that such a subject will not so soon be exhausted; but, as that which one perceives another may also see, it is right that each should hasten to publish the result of his observations, in order to have the benefit of them. Such is the object of this note.

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* *L'Institut*, No. 318, Jan. 30, 1840.

* *Comptes Rendus*, No. 8, Feb. 24, 1840.

† See *Comptes Rendus*, t. IX. p. 570.

‡ *Journal de Pharmacie*, February, 1840.

It is nearly two years since M. Bussy and myself first proposed to study this question; but after having devoted a whole vacation to it, without any great success, our necessary occupations obliged us to renounce this undertaking. However, not wishing that either of us should profit exclusively by that which we had done in common, we have thought fit, on the present occasion, to deposit here the little we have learned. We will first say, that the essential oil of mustard, obtained by the ordinary means, being submitted for several consecutive hours to a temperature of 100° in a distilling apparatus, allows to be volatilized, probably by assistance of a little moisture, a small quantity of a very fluid product; it is colourless, of a faint and somewhat etherial smell, not mixing with water, but communicating to it a sweet taste, like some ethers. The residue of this operation, that is to say, nearly all the essence, gives, by distilling with water, products whose density always goes on increasing; the first are lighter, and the last heavier, than the water.

If essential oil of mustard be rectified on the open fire, and so as to be able to ascertain the temperature, it is seen that ebullition commences towards 110°, afterwards it rises gradually to 155°, at which point it remains stationary during the remainder of the distillation. If, setting aside the last product, the first portion collected be rectified *de novo*, it will be observed this time that the liquid enters into full ebullition at 90°; and if the recipient be changed when the thermometer reaches about 130°, there are thus separated three products, whose densities are as follows, viz.:—

1st.	From 90°	to 130°	density 0·986
2nd.	130°	155°	1·009
3rd.		155°	1·015

What is very surprising is, that the lightest of these essences is also the deepest coloured; its tint is lemon yellow. The last is almost colourless.

This variation of density announces, to all appearances, a difference of composition; and thence arise, without doubt, the anomalies remarked in the analyses of this essence which have been published. We will endeavour to ascertain this.

The essential oil of mustard, shaken for some time in a close vessel with a concentrated solution of caustic potassa, is almost entirely dissolved, and the solution retains but little smell, but it acquires more or less of a brown colour. If, after some days' contact, this alkaline liquid be saturated by tartaric acid, there is formed a deposit of little, white, radiated crystals, which are not cream of tartar, but whose real nature is still unknown to us. Some drops of oil swim on the surface of the saturated liquid. By its distillation is obtained a deep yellow and very alkaline product, forming a blackish brown precipitate with the solutions of lead, while the residue of the solution gives, under the same circumstances, a white precipitate. It appears, therefore, that the sulphur abandons the saturated liquid to pass off with the distilled product, and necessarily in quite another state of combination.

In the few observations that we have been able to make concerning this curious essence, there is none which has appeared to us more important than that we are about to mention: it will fix, we think, the attention of chemists. That singular product will be remembered which was obtained by MM. Dumas and Pelouze, by making ammonia, whether liquid or gaseous, act on the volatile oil of mustard. This reaction did not realize the expectations which occasioned it to be tried, but it gave place to very remarkable results, of which, perhaps, the least astonishing is to see the very keen and irritating smell of each of these two bodies totally annihilated by their union. It suffices, to combine them, to put them in the vessel; the reaction operates of itself, and without the necessity of multiplying the points of contact by agitation; then, by simple exposure to the open air, the excess of ammonia is dissipated, and long, fine, white, inodorous prismatic crystals are obtained, as neutral, at least, as if the ammonia had been saturated by a powerful acid. The union is ever such that it offers more resistance than the ordinary ammoniacal salts, for it would be useless to attempt to drive away the ammonia by a more energetic base and by any means; according to MM. Dumas and Pelouze, the essential oil of mustard cannot be withdrawn from it. So that had these crystals been found before it was known how they were produced, it is to be presumed that the origin of them might have remained long unknown. It is very certain that the authors of this beautiful discovery, not seeing in what category this singular compound might be ranked, have proposed to consider it as an amide. Whatever it may be, we will say, and it is the principal fact that it is important for us to make known here, that these crystals, which seemed not to be attacked by any chemical agent, are decomposed with the greatest facility by the contact of the binoxide of mercury. The reaction of these two bodies, when they are dry and well porphyrized, and mixed in the proportion of five of oxide to one of the crystals, is instantaneous, we will say even almost volcanic; heat, liquefaction, and vapours are produced; the colour becomes of an intense black; this phenomenon results, according to all appearance, from the combination of the sulphur with the mercury. This mixture immediately becomes alkaline, without any development of ammonia. Not only is there none perceptible to the smell, but the most sensible reagent, weak hydrochloric acid, does not discover the slightest trace of it, even at the moment of the most powerful reaction. Moreover, this action being terminated, if the mixture be washed, either with ether or with pure water, a solution is obtained which, filtered and dried in the vacuum, leaves a viscous and somewhat oily residue, very alkaline, which treated when cold by caustic soda or potassa, does not disengage ammonia, and which, on the contrary, added to an ammoniacal salt, deprives it of a little alkali. The aqueous solution of this product is precipitated abundantly by tannin, combines with the acids, being saturated, and furnishing with some of them crystallizable products. Thus, without entering into longer details, it is evident at present, that this new body which results from the reaction of the binoxide of mercury on the crystals of MM. Dumas and Pelouze, presents the principal characteristics of organic alkaloïds, and that this alkaloïd is found there quite formed; and that it derives its origin from ammonia, but that it does not contain any. Let us remark, in conclusion, that this new fact comes to the support of an opinion given long since by one of us, namely, that it was to be presumed that the alkalinity of organic bases is derived from ammonia.

ON THE VOLATILE OILS OF MUSTARD AND HORSERADISH.*

BY MM. BOUTRON AND FREMY.

By passing, with extreme caution, a current of chlorine into a little tubulated retort, containing volatile oil of mustard, silky crystals are obtained, which are volatile, and endowed with great cohesion; they are insoluble in water and ether, and soluble in alcohol in all proportions.

Potassa converts them into a resinous matter, insoluble in that alkali. Air alters and colours them. If a great excess of chlorine be passed over these crystals, they are resolved into a viscous liquid, and the crystals can never be reproduced.

Caustic potassa exerts on the volatile oil of mustard a most violent reaction; when the bell-glass containing these two substances is gently heated, hydrogen is disengaged, as in the reaction of the same alkali on benzoil, and a soluble salt of potassa results. The acid of this salt is oily, insoluble in the water upon which it floats, but soluble in alcohol.

Horseradish contains the same matters as black mustard, and the volatile oil may be obtained from it by causing the emulsin of white mustard to act on the inodorous alcoholic extract of this root.

Horseradish, in its natural state, is completely inodorous, and the volatile oil appears to be formed only when the root is cut or divided.

EXPERIMENTS ON THE INFLAMMATION AND COMBUSTION OF GUNPOWDER.† [1]

BY M. PIOBERT.

These experiments complete those which the author has consigned in a preceding *Memoire sur la Théorie des effets de la Poudre*, which memoir the Academy ordered to be inserted in the *Recueil des Sa-*

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* *Journal de Pharmacie*, February, 1840.

† *Comptes Rendus*, *No.* 8, *Feb.* 24, 1840.

[1] In mentioning here several memoirs and pieces of correspondence which had arrived before the sitting of the 17th of February, and which time has not allowed to be communicated to the Academy, we have taken care to distinguish them from pieces which have been sent latterly.

vans étrangers; they confirm the laws of combustion and inflammation which were established in this first work, regarding powder at present in use in war, and show that these laws apply equally to all other kinds of powder.

The matter of which the grains of powder are formed burns in successive layers, of which the thickness is about 13 millimetres per second, when this matter is of an ordinary density, (óne and a half that of water), and varies in inverse ratio as the density.

The rapidity with which fire is propagated in a charge, from one extremity to the other, increases rapidly with the resistance of the envelope, and especially when there exists a vacuum in all the length; in firearms it is always very great, and so much the more as the grains leave between them a larger passage to the flame; in the case of long charges, without projectiles and inflamed from the side of the mouth, may break very thick wrought iron cannons. But this quickness of inflammation diminishes rapidly as the powder contains more charcoal dust, and when all the interstices which existed beween the grains and the length of the sides of the envelope are filled by this charcoal dust, the communication is slower; there is then no more than a combustion like that of fireworks, and the gases only act more weakly against the sides of the firearm. Indeed, if all the matter is in powder, combustion produces only a slight flame, and its speed is only about nine millimetres per second, while, in powder in grains, the celerity of the transmission of the fire is more than twenty metres.

These facts show the possibility of relaxing considerably the inflammation of masses of powder, by mixing the grains with the charcoal dust, or with one of its components, very finely triturated; the explosion would then be changed to a combustion, which would offer more to the same degree, the dangers which this energetic agent actually presents in its conservation.

ON THE ACTION OF CHLORINE ON QUININE.*

BY M. J. J. ANDRE′.

Gaseous chlorine put in contact for some moments with pulverized quinine, gives it the colour of red carmine, and renders it soluble in water. The solution becomes green by ammonia, unless it has been heated for some time, which makes it brown, as does also too prolonged an action of chlorine. The basic sulphate of quinine is less strongly attacked than the base itself.

In order to produce red colouring, when water intervenes in the action of chlorine on quinine, the latter must be light enough to float in great part on the liquid, and its parts, however, must preserve a certain mutual adhesion; accordingly it is proper to use quinine very dry, but yet not dishydrated. All that tends to put as great a quantity as possible of vegetable alkali in direct relation with a moderate current of chlorine, favours this colouring; all that tends to facilitate the division or solution of the quinine prevents or destroys it in proportion as it appears.

If the chlorine continues to come without interruption for three quarters of an hour or an hour into a kilogramme of water holding in suspension 5 grammes of quinine, it is remarked that the liquid after the complete solution of the akaloid becomes turbid and precipitates a white matter; at the end of an hour and a half, all the quinine may be regarded as disorganized; it no longer grows green by ammonia, which would indicate that some still existed.

The white matter being washed in order to remove the hydro-chloric acid, and dried in the shade, is pulverulent, rather fawn-coloured, very light, very difficult to be impregnated with water, dissolving in water by the aid of heat, but then passing to a reddish-brown state. It is soluble in alcohol, and the solution, which tastes very bitter, reddens blue turnsole paper; it is precipitated by nitrate of silver, acetate and subacetate of lead: the acids attack it with difficulty, even when pretty much concentrated; it is very soluble in the alkalies.

By the imperfect saturation, by means of alcohol and soda, of the liquid which has precipitated it, we obtain a new quantity of white matter which disappears if we wish to arrive at an entire neutralization: it disengages itself besides from the chloride of azote, which is recognized by its smell and by drawing tears from the eyes. This second portion of white precipitate is more soluble than the preceding; it passes more easily into the state of red-brown matter when it is in contact with oxygenated bodies: it appears united to some hypochlorite of soda.

If we completely saturate with quinine the chloruretted solution, at the first impression of heat it grows yellow, then brown; from alkaline its reaction becomes acid. By evaporation to dryness, a red-brown acid matter is obtained, containing much chloride of sodium and hydro-chlorate of ammonia. Alcohol at 33° separates the greater part of it from the salts; there remains then an extractive matter almost insoluble in alcohol at 40°, dissolving readily in water, and precipitated by nitrate of silver, acetate and subacetate of lead: the sulphate of iron produces no change in it; it has a bitter taste. This substance, like the white matter, on being heated with a little hydrate of potash, gives out some ammoniacal vapours, an effect which I think less attributable to azote which might have retained these substances, than to a certain quantity of ammoniacal salt from which they could not be freed.

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* *Annales de Chimie et de Physique.*

How does chlorine act on quinine? I think that that energetic agent forms with water hydrochloric acid and chlorous acid. The latter yields oxygen to the organic matter which at first loses its basic property, then is converted into a white resinoid matter susceptible of taking a new quantity of oxygen whether in coming in contact with the air, or with a hypochlorite, and of being then transformed into a red-brown extractive matter. Another portion of the chloric acid determines, by means of the elements of ammonia contained in the alkaloid, the formation of chloride of azote. The ulterior decomposition of this last body and of the hypochlorite of soda sufficiently explains the production of the hydro-chlorate of ammonia and of the chloride of sodium. There ought also to be a formation of carbonic acid.

It may readily be conceived that the phenomena which result from the action of chlorine or quinine, may be applied equally to the other alkaloids, except some particular facts. In continuing the reaction longer, it is to be presumed that the chlorine would convert them into oxalic ocid or any other very oxygenous acid.

ACTION OF CHLORINE AND AMMONIA ON QUININE.

When, in 1835, I pointed out the emerald-green colour as resulting from the action of quinine or its salts submitted successively, in a weak solution, to liquid chlorine and some drops of ammonia, I could not explain the formation of that colour and its little stability; I expect to be more fortunate now, and to add some facts to that curious reaction.

Thus ammonia, poured little by little, shaking every time, into the chloruretted solution of quinine, does not always make it pass to emerald green; it may present all the shades resulting from the mixture of green and red in different proportions, which has reference to the decomposition of a part of the green matter in presence of an excess of chlorine, and to its transformation to a red substance, of which we will speak further on. Another obstacle to producing the colour of emerald green, is the presence of a brown substance resulting from the prolonged action of the chlorine on the quinine, but by destroying it by a new quantity of chlorine, we give to the vegetable alkali, not disorganized, the property of becoming green by ammonia.

We have shewn before, the manner in which chlorine acts on quinine: here only the action is less energetic, since it does not last long; the vegetable alkali is not entirely disorganized, and in that state of alteration, it is precipitated green by ammonia; but the latter, in contact with chlorine, acts as soda or potash would have done, there is a formation of a hypochlorite of which the little stability is known; accordingly in becoming decomposed it oxygenizes by degrees the green substance at the ordinary temperature, it grows brown, and afterwards reddish brown. By heat the reaction is much more prompt, the green ammoniacal liquid loses by evaporation the free ammonia which rendered it alkaline, it becomes acid and assumes a red colour.

The green substance is well obtained by mixing 2 grammes of basic sulphate of quinine, and 500 grammes of liquid chlorine; they are allowed to re-act for 10 minutes, then the mixture is poured in about equal parts into half a dozen glasses containing from 5 to 6 grammes of ammonia. The precipitates formed are put on the filter; this being almost dried in a vacuum, is submitted to alcohol at 40°, and the tincture obtained evaporated in the same manner protected from the air. Notwithstanding these precautions, this substance cannot be preserved without alteration; it ends always by being transformed into a red substance; however, it is very soluble in alcohol, in ether, but less in water; the taste is bitter; being warmed in water, it grows brown, and afterwards grows red by the acids.

By evaporation of the chloruretted and ammoniated quinine, there remains a blackish-red substance adhering strongly to the sides of the capsule. Submitted to alcohol at 40°, which isolates almost all the hydrochlorate of ammonia that has been formed, a solution is obtained of a beautiful red carmine. The acids make no change in it; the alkalies precipitate from it a matter of a violet-red colour: chlorine takes the colour out, and by adding ammonia it no longer grows green. What seems to prove that this substance still contains quinine is, that we have only to add to it lime crumbled, then to submit the dry precipitate to alcohol at 36°, we obtain a solution of a light rose colour, which becomes green after having been successively put in contact with chlorine and ammonia.

The concentrated solution of red matter in the alcohol at 40° allows a part of that substance to be precipitated by the addition of a certain quantity of water; being dried, it is of the colour of wine-lees bordering on rose-colour, being re-dissolved into red carmine in alcohol and in ether, not altering in the air.

By soda or potash, the solutions of chloruretted quinine do not become green, but grow more or less brown; the alcoholic tincture obtained by means of the evaporated product is not a sufficiently beautiful red.

To sum up this series of experiments, we may see that under the influence of chlorine, quinine tends to become oxygenized more and more; that it may give birth to four distinct compounds having scarcely any common property except their bitter taste, which reveals their origin.

1. A green substance, very little permanent, a kind of combination of quinine and a substance analogous to the resins. 2. A carmine red substance of the same nature as the preceding, but more soluble and permanent, and more oxygenized. 3. A resinoid white substance, having a strong affinity to oxygen and very soluble in the alkalies. 4. A reddish-brown substance possessing all the characters attributed to the pharmaceutical extract in its greatest purity.

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ACTION OF ARSENIC ACID ON THE SUGAR OF THE CANE.*

BY M. L. ELSNER.

Professor Runge makes use, as is well known, in order to discover the smallest quantities of free sulphuric acid, of a solution of 1 part of sugar in 30 parts of water: he spreads this solution over a plate of porcelain, heats it to 100° by steam, and then pours on it, drop by drop, the liquid in which he is seeking for the free sulphuric acid; the black colour which is formed at the place touched makes him infer the presence of that acid. M. Runge directs attention to the fact, that phosphoric acid and other free acids do not decompose sugar in that manner; but arsenic acid must be excepted, as I am going to shew.

I had already, in 1827,† been the first to call attention to the remarkable red colouring, presented by different species of sugar, when they are left long in contact with concentrated solutions of arsenic acid in water, an interesting phenomenon, of which I attempted to give an explanation in 1831.‡ I shewed that in that reciprocal action of cane-sugar and arsenic acid, both undergo an alteration; that in fact the first passes into a state of grape-sugar, and that the arsenic acid is brought partially to a degree of inferior oxidation. I then accounted for this reduction by the action of the carbon, which was separated from the sugar in the way of decomposition, and the red colouring produced in the solution of the sugar by the separation of carbon to a state of extreme division. M. Malaguti has shewn, in his memoir on the action of diluted acids on cane-sugar,§ that ulmic acid is then formed, and among the acids mentioned as producing that change is also found arsenic acid. Thus, that which I before took for very minutely divided carbon has been recognized, by a more attentive examination, as an acid very rich in carbon, of which the gradual formation is the cause of the red colouring, when the solutions of sugar and arsenic acid experience a reciprocal reaction. After having read the instructions of Professor Runge on the investigation for free sulphuric acid, I have tried, in the same manner, the action on sugar of very weak solutions of free arsenic acid, and I have found the following results:—

Over a plate of porcelain was spread a solution of 1 part sugar in 30 parts water, heated by the steam of boiling water, and then sprinkled with a drop of a solution of 1 part arsenic acid in 100 parts water: at the end of some seconds of reaction there was formed at the edge a red streak, which gradually grew broader, and at length produced a beautiful crimson spot on the white china plate.

With a solution of 1 part arsenic acid in 300 parts of water submitted to the operations already mentioned, there was formed at the edge a manifest streak of crimson; the spot exhibited an orange colour towards the centre.

A solution of 1 part arsenic acid in 1200 parts water produced, under the same circumstances, on the edge only, a small red streak, which was only of a yellow colour towards the centre.

With a solution of 1 part arsenic acid in 1800 parts water, there was no more any change of colour, and I could not observe on the china plate anything but a bright varnished surface, formed by the evaporated solution of sugar.

Thus it results from these researches, that the free arsenic acid, in acting on the sugar under the same circumstances as free sulphuric acid, produces also a shade of colour, which certainly is not visible with so weak a solution as is observed with free sulphuric acid, according to M. Runge, but which yet deserves in all cases to be quoted immediately after the reactions of sulphuric acid.

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[*] *Journal de Pharmacie.*

[†] See *Schweigger's neue Journal für Chemie*, vol. xx. page 348.

[‡] See *Schweiggerseidel's neue Journal für Chemie*, vol. i. p. 350.

[§] See *Journal de Pharmacie*, Sept. 1835, p. 443 to 457.

Professor Hünefeld has shewn again that the sugar of milk, gum, &c., is also blackened by free sulphuric acid under the same circumstances as sugar.

ON THE COLOURING MATTER OF THE POLYGONUM TINCTORIUM.[*]

BY M. COLIN.

M. Colin has addressed a Memoir to the Academy of Sciences, containing the results of the new researches which he has made on this subject. The results to which he has been led, and which differ in several respects from those which he had thought that he could deduce from preceding experiments, are thus summed up.

Oxygen alone does not produce the blue in the infusion of polygonum made with boiling water, neither does the open air produce it; but both make the infusion blue with water at 65°.

Sulphuric acid produces only a purple red, whether it is employed alone or with the addition of azote; but on contact with the air, or with oxygen, that acid always produces blue in the aqueous infusions of polygonum.

Lime-water deprived of air precipitates the infusious of polygonum into a bluish or greyish white; it produces nothing more in it, in presence of azote: but by introducing oxygen it generates green in the infusion made with boiling water, and blue when water at 65° is used.

Accordingly, oxygen is necessary to the production of indigo blue only. It could not, any more than oxygen, produce that colour cold in an infusion prepared at the temperature of 100°. However, water deprived of air may with impunity be heated to the boiling point, provided the leaves of the polygonum tinctorium are kept from the contact of that gas; for then the infusion becomes blue on contact with the atmosphere, as if it had been prepared at a temperature of 65°, and the precipitate which results from it is no less abundant. It is, therefore, not indifferent whether boiling water is thrown on the leaves in question, or whether the boiled water which covers them, be gradually raised from the ordinary temperature to that of 100°.

ANALYSIS OF BONES AFFECTED WITH SOFTENING.[†]

M. Rees, several of whose essays we have already made known, has analyzed bones affected with softening :—The following are the results obtained :—

DISEASED AND SOFTENED BONES.

	Earthy Matter.	Animal Matter.
Skin . . .	32·50	67·50
Rib . . .	30·00	70·00
Vertebra .	26·13	57·42

BONES TAKEN FROM A MAN IN A HEALTHY STATE.

	Earthy Matter.	Animal Matter.
Skin . . .	60·02	39·98
Rib . . .	57·49	42·51
Vertebra .	57·42	42·38

The same order in the proportions of earthy to animal matter is therefore observed in diseased and in healthy bones.

M. Rees having repeatedly analyzed the earthy matter of the long bones of the extremities, and that of the trunk in a healthy state, and having found in the first 86 parts in 100 of phosphate of lime, and 83 in 100 in the latter, submitted to the same analysis the earthy matter obtained from the skin, the rib, and the vertebra, in the softened state, and found only 78 parts in 100 of phosphate of lime.

He concludes from this result that in the earthy matter which is absorbed, phosphate of lime predominates.

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[*] *Journal de Chimie Medicale*, Feb. 1840.

[†] *Journal de Chimie Médicale*, Feb. 1840.

II. CHEMICAL MANUFACTURES.

EXPERIMENTS ON THE FORMATION OF BLEACHING POWDER.

BY JAMES S. MUSPRATT, ESQ., OF LIVERPOOL.

Having been induced, whilst studying at the London University, to make some experiments on bleaching powder, I entered upon the subject about ten months ago. I had not proceeded far with my experiments before I left London, and did not bestow farther attention on the subject until within the last four months, when circumstances enabled me to avail myself of the valuable assistance of Mr. James Young (late assistant to Professor Graham.) Aided by him, I commenced a series of carefully conducted experiments, and have obtained results which appear curious, and may tend to remove some of the doubts relative to the composition of this important article of commerce. Many theories have been brought forward concerning the composition of this compound. At one time it was supposed to be a hypochlorite of lime with chloride of calcium; but this theory seems latterly to have died away. From the following experiments its composition may be easily seen.

1*st Experiment.*—Passed chlorine gas over pure lime ($\dot{\mathrm{Ca}}$); but after the chlorine had passed over it for four days there was no increase of weight, which proves that lime will not combine with chlorine gas unless water be present.

2*nd Experiment.*—Passed dry chlorine gas over perfectly pure protohydrate of lime ($\dot{\mathrm{Ca}}\,\dot{\mathrm{H}}$) until the augmentation of weight ceased: this was when the protohydrate of lime had taken up 36·2 per cent. of the gas.

3*rd Experiment.*—Took an equivalent of protohydrate of lime (37·54), and mixed it intimately with an equivalent of water. The mixture was then submitted to a stream of chlorine gas. In this experiment the additional atom of water caused the protohydrate of lime to take up from 45 to 46 per cent. of the gas, which is about 9·00 per cent. more than the protohydrate of lime took up by itself.

4*th Experiment.*—Mixed intimately equivalent proportions of protohydrate of lime and chloride of sodium, and submitted the mixture to a stream of chlorine gas. In this experiment the chloride of sodium caused the protohydrate of lime to take up the same quantity of chlorine as the second atom of water did in experiment third. The chloride of sodium cannot have acted chemically: it must have acted merely mechanically, and so must the second atom of water, for the additional atom of water is no more essential to the formation of bleaching powder than the chloride of sodium, or any other salt.

I replaced the water by chloride of barium ($\mathrm{Ba\,Cl}$), chloride of potassium ($\mathrm{K\,Cl}$); sulphate of lime ($\dot{\mathrm{Ca}}\,\dddot{\mathrm{S}}$); sulphate of barytes ($\dot{\mathrm{Ba}}\,\dddot{\mathrm{S}}$); crystallized sulphate of soda ($\dot{\mathrm{Na}}\,\dddot{\mathrm{S}}+10\,\dot{\mathrm{H}}$); caustic lime ($\dot{\mathrm{Ca}}$), &c.; and I found that any of these salts when mixed with protohydrate of lime caused it to absorb 9 or 10 per cent. more of chlorine gas.

From the foregoing experiments, the composition of bleaching powder, containing 36 per cent. of chlorine, appears to be a subchloride of lime, with an essential atom of water; and bleaching powder containing 45 per cent. of chlorine, a subchloride of lime, with an essential, and also a mechanical atom of water.

When the last-named compound is rubbed in a mortar with perfectly dry chloride of calcium, a quantity of chlorine gas is liberated.—Why? Because the chloride of calcium being a hygrometric body, takes the mechanical atom of water from the compound, and the superfluous chlorine escapes.

The chlorine gas for the preceding experiments was made by adding hydrochloric acid to chlorate of potash. The gas, before it came into contact with the different mixtures, passed first through water and then through two glass tubes containing chloride of calcium, so that it was perfectly pure and dry.

The experiments made afterwards by Mr. Young coincided very closely with those I have stated; I per cent. being the greatest difference in any of them.

METHOD OF BLEACHING AND REFINING PALM OIL, ANIMAL AND VEGETABLE OILS, ETC.

BY CHARLES WATT.

It may be unknown to most of our readers, that Palm Oil is an article of very large consumption among soap-makers, in consequence of its being generally cheaper by more than ten pounds per ton than tallow.

The great difficulty, however, of employing it for soap-making, in large quantities, arises from its colour, which is of a deep blood red. This it has long been an important desideratum to remove; and various processes, more or less successful, have been adopted for the purpose.

After a great number of experiments, I have been enabled to establish a method of effecting this, which has been in full operation at most of the largest establishments in the kingdom, and which has met with the most unqualified approbation of their proprietors, who have consequently given the highest testimonials of its value.

For this process, I have obtained a patent; and therefore I shall give a brief description of its various parts, in order to ensure the due effect of the operation, and to render perfect the purity and decoloration of the oil.

In the first place, however, I may remark that I had long been of opinion, that the colouring matter of the oil depended upon a peculiar vegetable principle, held in solution by the elain, or oily part, and not by the stearine; as, when separated by any chemical means from the elain, the stearine is perfectly white.

My object, therefore, was to decompose this peculiar substance without injuring the oil.

Chlorine and its compounds, which are generally resorted to for bleaching, I found to be not only expensive and very troublesome, but to give a brown and dirty colour to the oil, and also to weaken and injure it, so as to make it much less fit for the purposes to which it is generally applied.

I conceived that the most effectual method of removing the colour would be, to operate upon the oil with some compound which contains a large quantity of oxygen, and readily gives it up when placed in contact with other bodies. The substance which I found to answer this purpose, was chromic acid, which I employ in the following way:—

I cause the oil to be boiled in a steam-vessel for half an hour, then left to settle, and cool down to about 130° of Fahrenheit's thermometer. After this, I direct it to be removed into wooden vessels, each capable of containing about half a tun; great care being taken that no water or sediment, which is chiefly vegetable matter, is introduced; as, if any of the latter be present, it decomposes the chromic acid, and consequently prevents its effect upon the oil.

For the oil, thus cleared from all extraneous matter, I prepare the bleaching materials in the following quantities:—For one tun, viz., twenty-five pounds of bichromate of potassa, dissolved in no more water than is sufficient to make a saturated solution, to which is carefully added, about eight pounds of strong sulphuric acid, and about fifty pounds of muriatic acid; or the same weight of common salt may be employed, in which case sufficient sulphuric acid must be used to decompose it.

This mixture is then put into the oil, which is constantly stirred,—a very important part of the operation. In a few minutes, the colour of the oil changes, first to a black, then to a dark green, which soon again changes to a very light green, accompanied with a thick froth on the surface. This froth and light green colour, are proofs of the good colour of the oil, and the completion of the process.

I may here observe that if, upon taking out some of the oil, it is not found to be sufficiently decolored, a further quantity of the bleaching compound may be added to render the oil sufficiently white.—When the process has been well managed, and the articles of the mixture have been pure, I have seen a tun made quite colourless in five minutes.

During the process, a very powerful kind of action seems to be going on, and the oil loses that heavy and glutinous consistence it possessed before the operation.

After the oilis quite white, I let it settle for about half an hour, to allow the chemical matters that have been employed to subside. It is next to be pumped off from these matters into a wooden vat, provided with a wooden or leaden steam-pipe, and to be boiled for a few minutes with some fresh water. It is then to be finally settled, in order either to be packed in casks or removed into the soap-copper.

It is almost needless to remark, what all chemists must know, that the chromic acid loses its oxygen during the process, and becomes the green protoxide of chrome: it is this decomposition which acts so important a part in the operation. It has another beneficial effect—it prevents the bad effects which the chlorine liberated by the decomposition of muriatic acid causes in making the oil to become of a brown or foxy colour, as it is termed by the workmen, and in injuring the consistence of the oil; whereas by the process I have described, the oil is rendered much harder.

The fluid vegetable oils, such as linseed, rape, and mustard, may be decolored by a dilute solution of chromic acid. As, however, in these oils the oxide of chrome combines with the glutinous matter they contain, I have found it better to add to the solution a little muriatic acid, which entirely prevents that effect; but I do not approve of more than just enough for the purpose, and I prefer adding it at the end of the operation, as it then combines with the oxide of chrome, without injuring the oil.

The oil is then to be washed with water, to free it from any acid; and it may here be observed, that in the bleaching as well as washing, a temperature of about 120° may be beneficial. The oil is then to be filtered, or to be kept warm long enough to settle, which will require about twelve hours.

In the case of olive oil, oil of almonds, and castor oil, no muriatic acid is requisite or proper.

With fats and fish oils, I proceed thus. If they be in a very bad state, and have been rendered when putrid, or have been charred, they must be boiled in the before-mentioned steam apparatus for half an hour, with a weak ley, containing about half a pound of pure soda to every ton of such fat. When this process is finished, there is added about half a pound of sulphuric acid, diluted with about six times its weight of water; it is then boiled for about fifteen minutes more, and allowed to settle for at least an hour; when the water and sediment may be drawn off, and it may be further bleached and refined by a solution of chromic with sulphuric acid.

In most cases, about four pounds of bichromate of potassa, and about two pounds of sulphuric acid, will be sufficient; but this must be regulated according to the colour and impurity of the tallow under operation.

Many base attempts have been made to pirate and infringe this patent by the ridiculous substitute of common salt for muriatic acid in the process of bleaching. This is, of course, a silly subterfuge, which the specification provides against, and which shall be made fully evident, when I have information that any parties are thus infringing my right.

REPORT CONCERNING A WATERPROOF SOAP.*

BY M. ROBIQUET.

M. Menotti presented some months ago a soap which, according to him, possessed the property of rendering tissues impermeable to water, without depriving them of permeability to the elastic fluids. Many samples of stuffs prepared by this means accompanied this soap. M. Dumas and myself have been appointed to examine them, and give our opinion of them to the Academy. We now come to acquit ourselves of this duty.

The utility of the result published by M. Menotti has been so generally felt, that for a long time it has been the subject of numerous experiments, and more or less happy applications; but, in general, the means hitherto employed have been so expensive, that these tissues could be purchased only by wealthy people; that is to say, by those who need them least. It has been the object of M. Menotti, on the contrary, to render them accessible to all, and to put the application of his method in the hands of every one. This method is indeed so easy, that there is no one who cannot put it in practice; for it consists simply in steeping a perfectly dry stuff in an almost boiling solution of this waterproof soap. When the stuff is uniformly impregnated, it is moderately wrung, left to dry, and all is terminated.

To assure ourselves of the truth of the facts alleged by the author, we went to his establishment, and there M. Menotti, who had told us the composition of his soap, prepared some before us. Many pieces of stuff were rendered impermeable; and that the indicated effects might become more evident to us, M. Menotti sprinkled some pieces of cambric muslin with the warm solution of his soap; he even traced some characters with this same solution. When the stuffs were dry, not a vestige of this preparation was visible; but when it was steeped in boiling water, immediately all the parts which had been impregnated with this soap were perfectly distinguished, and all the primitively traced characters were seen to reappear, because all that which the soap had touched not being allowed to imbibe, it results that the difference of shade renders these different parts very distinct from one another.

Indeed, we have sufficiently repeated the experiments, together and individually, to be able to say that we think M. Menotti has really attained the object which he proposed, and that as regards both utility and economy. Thus we have ascertained, by taking for a basis the price fixed by M. Menotti for his soap, that it will be possible, at a few centimes' expense, to render several metres of linen waterproof. To give a more precise idea of it, we will say that it will not cost more than 40 centimes to render an ordinary blouse impermeable, and about double as much for a soldier's cloak.

It is, doubtless, unnecessary to remark, that the closer the texture of a tissue is, the greater will be the impermeability. We will add, that it would probably succeed much better by impregnating with this soap, not only the tissue itself, but the first matter which served to manufacture it; it is, indeed, what M. Menotti has proposed to do, and as his preparation modifies very little the pliability of the textile fibre, he looks upon success as certain.

The immense advantages which would result from the adoption of a process as simple as economical, are evident; as well as the many obligations all those who enjoy the sad privilege of exercising any profession whatever on the public way, exposed to the injuries of the air, will be under to M. Menotti. It will, doubtless, be decided in common with us, that when time shall have added its sanction to the hopes which the process of M. Menotti allows us to conceive, no one will be more worthy than him of participating in the beautiful bequest of M. Montyon to those who are so happy as to alleviate in their fellow-creatures some of the human miseries.

We have the honour of proposing to the Academy that it grant its approbation to the waterproof soap of M. Menotti.

The conclusions of this report were adopted.

PHYSICO-CHEMICAL INVESTIGATIONS CONCERNING DYEING.†

BY M. CHEVREUL.

The investigations of M. Chevreul in dyeing are composed of three series:—

The first comprises all that relates to the *principle* of the simultaneous contrast of colours.

The second, that which relates to the *principle of their mixture.*

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* *Comptes Rendus*, No. 7, Feb. 17, 1840.

† *Comptes Rendus*, No. 4. Jan. 27, 1840.

The third contains *researches essentially chemical.*

The Memoir, of which the following is an abridgment, belongs to the second series: in it the author considers, in an abstract point of view, the *principle of the mixture of colours,* and its application.

I. OF THE PRINCIPLE OF THE MIXTURE OF COLOURS IN AN ABSTRACT POINT OF VIEW.

The principle of the combination of colours, long admitted by dyers and painters, consists in this; 1st. If red, yellow, or blue colouring matters be mixed two and two, orange, violet, and blue are obtained; 2nd. If all three be mixed in proper proportions, black is obtained.

The following example shows that this principle is contrary to that of the simultaneous contrast of colours. Indeed, when there is a mixture of a yellow and a blue matter which appears green, the eye distinguishes neither the yellow nor the blue; it receives the impression of green, resulting from the yellow and the blue. If there is seen, on the contrary, a yellow zone contiguous to a blue one, the two colours, instead of approaching by becoming green, will seem to be removed, since the yellow will appear orange and the blue violet, or, what is the same thing, the yellow will lose from the blue, and the blue from the yellow.*

II. OF THE APPLICATION OF THE PRINCIPLE OF THE MIXTURE OF COLOURS.

It is the application of the principle of mixture of colours to dyeing, to the bleaching of stuffs, &c. &c., to the arts of the upholsterer, to printing upon stuffs, paper, &c. &c., that M. Chevreul has proposed especially to develope in this part of his Memoir: he makes this application;

1st. To the formation of black;

2nd. To what is called in dyeing browning (*bruniture*), or "*rabat.*"

3rd. To bleaching.

I. *Application of the principle of the mixture of colours to the formation of black.*

M. Chevreul,—without occupying himself with the question of knowing if all the blacks produced in the arts may be represented by a union of particles reflecting red, yellow, and blue, or two complementary colouring matters,—sets out with the fact *that matters of complementary colours, mixed in proper proportion, make black, if they reflect only very little white light, or if they reflect, in a sensible manner, normal grey, that is to say, a grey which is neither red, blue, yellow, orange, violet, nor green.*

Conformably to this principle, and by means of the *chromatico-hemispherical construction,* invented by the author, it is always easy to know the colour which must be added to a given colour to produce black, whether in dyeing, or in any art whatever in which bodies are mixed which are without mutual chemical action, or, which, if they exert any, it would be incapable of changing their respective colours

2. *Application of the mixture of colours to the formation of browning* (bruniture.)

When three matters presenting the three simple colours are mixed, red, yellow, and blue, or two matters of mutually complementary colours in different proportions from those in which neutralisation is possible, the result of the mixture is black, rather than the simple colour or dominant binary.

M. Chevreul has shown that this principle is as applicable to the arts of upholstery as to dyeing.

It is particularly when it is wished to prepare a dye of solid faded (*rabattues*) colours, that the application of the foregoing principle is found useful, since it may generally be said that the stability of the products to which it gives rise is equal to that of coloured matters which have been mixed; consequently, when these matters belong to colours of high tint, the faded colours are more stable than those which are so by the process generally adopted, which consists in tarnishing free colours with a kind of ink called "*rabat.*"

3. *Application of the principle of the mixture of colours to bleaching.*

M. Chevreul shows by experiment that a light colour which may have a white body, a stuff, for example, may be neutralised by adding, in proper proportion, a matter of the complementary matter of that which it is desired to remove.

Thus when linen, silk, and wool have an orange tint, it may be neutralised by blue; when they have a yellow tint, it may be neutralised by violet, or red and blue; indeed, is the tint an orange yellow?—it requires a violet blue like ultramarine.

But is a yellow stuff, to which has been added red and blue, or violet, and which appears whiter than before the addition of these colours, identical in aspect with the same species which does not contain any coloured particle? No, it is sufficient to look at it upon a ground as white as snow to discover a normal grey tint, so that it is, relatively to a perfectly white sample of the same stuff, what a second perfectly white sample would be, if seen in a light shade when the other was seen in a direct diffused light; thus, *in dyeing as in bleaching, to neutralise a colour by a complementary colour, is to pass the stuff from a coloured shade to a shade of normal grey.*

MM. Tresca and Eboli have applied the

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* See M. Chevreul's work, *De la loi du contraste simultané et de l'assortiment des objets colorés, &c.*

principle of the neutralisation of colours to the manufacture of the stearic taper, and their results are identical with those which M. Chevreul has obtained in dyeing and in tapestry.

Indeed, a pupil of M. Chevreul, M. Chamblant, director of a glass-house, has also produced colourless glass by melting vitrifiable matters, which separately would have given two glasses of mutually complementary colours.

Conclusions.

1st. When a proper proportion of suitably powdered coloured bodies is mixed, whether of tinctorial matters, or coloured powders employed in painting, or, indeed, threads fit for tapestry, the result of the mixture is black, if it reflects little or no white light; if it reflects a notable quantity, it is normal grey.

2nd. This principle and the observation that two light complementary shades are more perceptible as coloured lights than the very pale grey to which their mixture gives rise, explains the result obtained by every process where a light tint of a white object is destroyed by the addition of a coloured matter; so that, as M. Chevreul has said, the process of making black by complementary colours, and that of increasing the whiteness of a slightly coloured surface by the addition of a colour, flow from the same principle.

The generality of the result at which M. Chevreul has arrived will appear still greater, if we call to mind that by means of the same principle he has destroyed an effect of contrast which has some inconvenience when it is desired that drawings should appear colourless, that is to say, white, or of a normal grey on coloured grounds; instead of appearing of the same colour as these grounds, as at present. It is sufficient to mix with the matter of the drawing a little of the colour of the ground, in order that this complementary colour may be neutralised by the colour added. Then the result produces the effect of normal grey, as though the complementary colour really resided in a matter allied to white matter. The same addition may be made to the matter of black drawings upon coloured grounds.

ON THE MANUFACTURE OF FLINT-GLASS AND CROWN-GLASS.*

BY M. BONTEMPS.

M. Bontemps announced, eleven years ago, that according to the indications of M. Guinand, jun., he had been enabled to make flint-glass equal in purity to that made by M. Guinand, sen., and he exhibited several discs, among which was one of 33 centimetres, of which M. Lerebours made an excellent telescope, and another of 38 centimetres, the greatest dimension which had then been obtained. But these discs, although free from streaks, were not without fault; they contained, like those of M. Guinand, numerous bubbles, which occasion a slight diminution of light; besides, he had not yet manufactured crown-glass; he had therefore but imperfectly resolved the problem of the manufacture of optical glass. M. Bontemps now announces that he has at length been enabled to manufacture flint and crown-glass free from streak and bubbles, and perfectly white, and that the loss of the secret of a product of such scientific importance may not be hazarded, he is about to make known the process and all the details which ensure its success.

M. Bontemps begins by giving the history of the experiments made by men of science and manufacturers, since the discovery of achromatic telescopes by John Dollond. M. Guinand, although a stranger to science and the art of glass-making, is the first who has made flint-glass free from striæ. He was acquainted with that process of glass-making which consists in stirring the glass with an iron bar, to make the waves resulting from a bad mixture disappear; and he thought that if the stirring were continued longer, not only the waves but the streaks would be destroyed; and as it cannot be stirred long with an iron instrument which is heated and oxidized, he conceived the ingenious idea of making a cylinder of a refractory earth, that is to say of the same matter as the crucible, closed at the bottom, and open at the top to receive an iron bar hooked at one end, with which he moves the cylinder in the glass; being able in this manner to substitute several bars of iron as they become heated, he was able to stir as long as he pleased, and destroyed the streaks. But M. Guinand had left in uncertainty several elements of the problem, and had not occupied himself in the manufacture of crown-glass, a manufacture which offers many difficulties of another nature, especially those which result from the propensity which silico-alkaline glasses have to devitrify by slow cooling in large quantity.

Among the difficulties which are met with in the manufacture of flint as well as crown-glass, that of obtaining these two glasses free from bubbles is not among the least, and M. Bontemps had not completely surmounted it in 1828. After numerous experiments directed principally to a peculiar mode of stirring, he at length discovered that the absence of bubbles resulted from good proportions in the composition, and especially from certain precautions in the management of the fire towards the end of the operation.

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* *Comptes Rendus*, No. 4, Jan. 27, 1840.

To avoid streaks and bubbles in the manufacture of flint-glass is not all; it is also important to have the greatest transparency; for even a slight colour causes a loss of light. For astronomical telescopes, and especially for the Daguerréotype, an object glass of the finest quality is required. Flint-glass at the density of 3·1 to 3·2 is always very white; but opticians do not find this density sufficient. A greater density facilitates achromatism and permits a shorter focus. Now, as soon as the density is augmented by a greater proportion of oxide of lead, flint-glass frequently acquires a very prejudicial yellowish tint. M. Bontemps thinks, therefore, that he has obtained an important result in producing flint-glass of the density 3·6, whiter than any of those which have hitherto been produced, and as white, in a word, as the finest crystal, and crown-glass as white as the most beautiful glass of Saint-Gobain or Saint-Quirin.

M. Bontemps joined to his memoir the plans of the furnaces and crucibles, and pointed out the method to be pursued to obtain flint and crown-glass; he announces that he means to construct lunettes of superior dimensions to any that have hitherto been made; he will supply opticians with discs of flint and crown-glass of 40, 50, and even 60 centimetres in diameter.

WRITINGS ON PARCHMENT.—FALSIFICATION.—REPORT ON THAT SUBJECT.*

I, Jean Baptiste Chevallier, chemist, Member of the Royal Academy of Medicine, Professor in the School of Pharmacy, commissioned by an order of the 15th of March, 1838, *to examine if writing on erasures, and alterations, exist in the Diploma of Bachelor in Letters, bearing the name of G ...., and if it has been bonâ fide delivered to M. G...., who was the bearer of it.*

In order to obey the aforesaid order, I repaired, on the 4th of May, to the cabinet of the Judge of Instruction; and there, after taking the oath to perform well and faithfully the commission intrusted to me, he put that diploma into my hands, in order to my making the experiments necessary to enable me to answer the question.

Physical Examination of the Diploma.

The physical examination which I made of that diploma shewed me, 1. That it was soiled and *shrivelled* in most of the parts on which different designations are written, such as the name, the christian name, the place of birth; 2. That this shrinking, *this shrivelling of the parchment*, seems to indicate that this diploma was washed, and that being placed in circumstances not foreseen by the person who washed it, nothing had been done to obviate the shrinking of the parchment; 3. That the writing of the names, Christian names, place of birth, is not the same as that of the writer of the first line, *Marthe Camille, &c.;* 4. That in different parts of the diploma, and particularly under the words G...., 11th line; G...., 7th line, *département de l'Ardèche*, 9, *Novembre*, 1813, there are *transparent places* or *marblings* which seem to indicate that the surface was scraped, which has thinned the parchment; 5. That under the word *Aix*, line 7th, there are traces of old writing. All these observations seem at first view to indicate that the diploma which I have examined has been washed with the view of substituting other particulars for the writing removed.

CHEMICAL EXAMINATION OF THE DIPLOMA.

This diploma has been washed with distilled water in the parts which were shrunk and shrivelled. The liquid obtained from this washing, being divided into three parts, was examined by the nitrate of silver, by ammonia, by muriate of baryta, by nitric acid, by evaporation and the employment of chloride of platinum; and it was discovered that the liquid contained chlorine or chlorides, sulphuric acid and potassa. Chlorine or chlorides and sulphuric acid are products employed to remove writing; and potassa to saturate the acids employed, or else as forming a constituent part of the chloride of potassium.

These operations being terminated, and the wetted parts of the diploma dried, those parts were then submitted to the solution of gall-nuts spread by means of a pencil. The employment of this solution, repeated several days successively, made to re-appear; 1. Under the word *Aix*, letters which go beyond that word; but as these letters are masked, it has not hitherto been possible to decipher them; 2. Between the words *Gaspard* and *Albert*, line 7th, the letters *re*, which would seem to indicate that one of the Christian names originally in the diploma was terminated by those two letters; 3. Between the letters *rt*, of the word *Albert*, the letter *e* has re-appeared.

From this I draw the conclusion:

1. That the diploma submitted to my examination has been washed with chlorine or chlorides in order to remove writings which existed there before.

2. That this diploma received, in the parts containing the names, Christian names, the place of birth, other writings

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* *Journal de Chimie Médicale*, February. 1840.

than those which had been put there originally.

3. That some parts of that diploma appear to have been altered by scraping.

In here pointing out the letters of the old writing which have re-appeared, it must be observed that possibly after some time other letters belonging to the original particulars of the diploma may re-appear, a fact which has already been observed.

PROCESS FOR OBTAINING PHOTOGENIC IMAGES ON PAPER.*

BY M. BAYARD.

I had deferred until now making public my photographic process, wishing previously to render it as perfect as possible; but as I cannot prevent something transpiring, which might, profiting more or less by my labour, deprive me of the honour of the discovery, I do not think I ought to delay any longer to make known the method which I have found successful.

There is no time for me to enter into the necessary details, but if the Academy will allow me, I will complete the remarks in the next sitting. The following is a brief sketch of my process:—Ordinary letter paper having been prepared according to Mr. Talbot, and blackened by light, I steep it for some seconds in a solution of iodide of potassium; then laying it upon a slate, I place it in the bottom of a camera obscura. When the drawing is formed, I wash this paper in a solution of hyposulphite of soda, and then in pure warm water, and dry it in the dark.

PROCESS FOR OBTAINING PHOTOGENIC DESIGNS ON PAPER.†

BY M. VERIGNON.

White paper should first be washed with water acidulated by hydrochloric acid, then, after desiccation, steeped in a solution composed as follows:—

Water 14 parts, with 1 part of a compound formed of 2 parts of muriate of ammonia, 2 parts of bromide of sodium, and 1 of chloride of strontium.

The paper, dried again, is passed into a very weak solution of nitrate of silver. There is thus formed, by double decomposition, a chloride and bromide of silver, which is made to turn black by exposing the paper to the light for about half an hour. Paper thus prepared may remain sensible during a fortnight, but at the end of that time the black has penetrated to the other side of the paper, which has then lost its sensibility.

To obtain the photogenic effect, it is sufficient to steep the paper in a very weak solution of iodide of sodium, and to carry it immediately, and quite wet, into the camera obscura, placing it in such a manner as to receive the luminous image; at the end of twelve minutes, if the weather is favourable, the photographic effect is entirely produced. We will observe, that when the blackened paper is steeped in the solution of iodide of sodium, it must be placed in a dark or very ill lighted place. The image obtained on the paper requires no more to fix the drawing, than to be passed into a solution of hyposulphite of soda and iron, then to be washed in pure water; the operation is then terminated.

In respect to the theory of this operation, it may first be remarked, that the addition of the alkaline bromide is with the view of forming a more sensible paper than with the chloride alone; a fluoride would have the same result; the preparation would be even too sensible. Again, it will be remarked, that light acts in the operation in three very distinct manners, and at three times: first, it makes the chloride of silver, which is white by itself, pass to the state of subchloride, which is black; then, in the second place, in the camera obscura, it determines the decomposition of the black subchloride by the alkaline bromide, but only in the points where the light arrives in the form of an image, and proportionally to the intensity of the action of its rays; indeed, it acts more or less powerfully on the iodide of silver, as on the plates of M. Daguerre.

PHOTOGENIC IMAGES OF MICROSCOPIC OBJECTS.*

BY M. DONNÉ.

M. Donné presented several of these drawings, obtained with the ordinary compound microscope, and exhibited to the Academy the little apparatus of which he availed himself to produce them.

After having removed the eye-glass of the microscope, I receive the image of the object on a small transparent screen which serves me to find the focus: I then substitute for the screen on iodized plate, and when the light has produced its impression on this plate, I expose it in the usual way to the vapour of mercury.

I have only succeeded in these experiments by receiving the direct solar light on the reflecting mirror; the flame of a good

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* *Comptes Rendus*, No. 8, Feb. 24, 1840.

† *Comptes Rendus*, No. 8, Feb. 24, 1840.

* *Comptes Rendus*, No. 8, Feb. 24, 1840.

Argand lamp produced nothing in the space of two hours and a half.

The microscope-daguerréotype which I present, of which I owe the first idea to M. Doyere, is now regularly made by M. Soleil, after the model which I have given to that skilful optician.

ON PHOTOGRAPHY.*

M. Arago communicated to the Academy of Sciences at its sitting of the 23rd December, in the name of M. Daguerre, a new modification introduced by that eminent scientific man, in one of the times of the preparatory operation which the plates are to undergo, in order to be fit to preserve the images which come to be reflected on them. The object in view is the application of iodine, which is to be made, as already known, equally on the whole surface of the plate, and to determine on it, in order to fulfil the object, a fine gold colour. In the first preparations to perform that operation, use was made of a capsule, in which the iodine was deposited; and, as the surface of this focus of evaporation was limited, it was necessary to wait a considerable time to obtain the result sought for. M. Daguerre, to remedy this inconvenience, which prolonged so much the duration of the operation, thought of substituting for the capsule a piece of pasteboard, with the iodine spread on it. This pasteboard is placed in a box, and may be prepared beforehand. Into the same box is put the plate, which is to be coated with iodine, and two minutes are sufficient to prepare it properly. Further, it is always necessary, in order that the vapour should be evenly spread, to put the small borders which were applied in the old process.

M. Daguerre hopes that he is in the way of discovering an almost similar modification, which would also much abridge the time during which the plate is exposed to the vapour of the mercury.

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* *Journal de Chimie Médicale*, February, 1840.

FRAUD AS TO COTTON GOODS.

Among the numerous and reprehensible frauds and adulterations which now-a-days are practised by tradesmen and manufacturers, in almost every article of food or commerce, we must mention one which, as often falling most heavily on the poor, is the more scandalous, and deserving of exposure.

It has been represented to us, that many of the cotton goods manufactured at Manchester and other places, are made to weigh heavy by means of a compound of a finely ground carbonate of baryta, mixed up with some feculent substances, which gives the goods a great increase of weight, and makes them appear of a very firm and close texture. A case of this kind lately occurred, which it may be worth while to state.

Some goods thus fraudulently treated were consigned to a merchant at Constantinople, who, in the course of his dealing, had supplied some to the Grand Vizier. It happened that this chief was one day walking, clothed in a dress made of these goods, when suddenly there came on a heavy shower of rain. The consequence was, that the rain soon wetted his garments; the white powder of carbonate of baryta ran down even to his feet, and his dress was then reduced to a flimsy, wet rag, having lost all its stiffness and beauty. The vizier was so exasperated, that he sent men immediately, and had the poor merchant so severely bastinadoed that he was unable to leave his house for a month. The merchant wrote immediately to the manufacturers in Manchester, telling them what we now relate, and entreating them, on no account, to send him any more goods of this kind.

We are quite sure that our readers will agree with us in thinking that, as the poor merchant suffered for the sins of the manufacturers, we are fully justified in thus exposing the practice of the latter.

III. PHARMACY, &c.

VACCINATION REPORT.

Presented to both Houses of Parliament by the National Vaccine Establishment.

To the Right Hon. the Marquis of Normanby, principal Secretary of State for the Home Department.

My Lord,—The experience of another year has confirmed our conviction of the efficiency of vaccination as the best security and protection against small-pox, and has afforded us, moreover, proofs of the propriety, in the present state of our knowledge, of preferring vaccine matter, the produce of the original virus furnished by Dr. Jenner, which has now passed happily through successive generations of subjects in the course of forty-three years, and which forms the principal source of our supply, to any which may have been taken recently from the cow.

We admit that it is sometimes stated to us by our correspondents that the supply which we had sent them has failed, but the same post has generally brought us intelligence that the material supplied from the very same source had succeeded elsewhere, and that it was found efficacious in Somersetshire when it was said to be inefficient in Wiltshire. We have concluded, therefore, either that it has been injured somehow in its transmission, or that the patients submitted to it were not in a fit condition to receive its influence, in consequence of some eruptive disease having preoccupied their constitution, or of some prevailing epidemic disorder having rendered them insusceptible of another and a new excitement for a time.

The number of patients dead of small-pox within the bills of mortality, if we can trust them, has been less this year than any one since vaccination has been practised; and we are justified, by a careful retrospect of several years, in stating that 4,000 lives, on an average, are saved every year, within the district of the bills only, by vaccination having superseded so largely the practice of inoculation.

We have vaccinated, at our several stations, 13,144 persons, and have sent out 165,395 charges of vaccine lymph since our last report to Parliament in 1838.

Henry Halford,
Pres. of the Royal College of Physicians,
President of the Board.
Robert Keate,
President of the Royal College of Surgeons.
Thomas Mayo,
Senior Censor of the Royal College of Phys.
Clement Hue, M.D.,
January 28, 1840. *Registrar.*

FREQUENT AND WEAK INJECTIONS, WITH SULPHATE OF ZINC, IN GONORRHŒA.

This consists, says a correspondent of the *Lancet*, in injecting into the urethra a solution of sulphate of zinc, which should be so weak as to cause but slight pain; the proportion of one grain to an ounce of water has been found most efficient, but should this occasion pain, more water may be added. Before every injection, the patient should discharge urine in order to remove from the canal any morbid matter which may be collected in it. The syringe, which should be covered round the extremity with lint, being filled with the solution, its point must be introduced into the orifice of the urethra, the handle of the piston must be pressed, and the contents injected. That the solution may remain in contact with the diseased surface, the instrument is to be kept in this position for the space of a minute, when it may be withdrawn, and the liquid will be ejected, which terminates the operation.

This application, if properly administered, causes a little smarting in the canal, soon followed by evident relief in passing urine. Any pain caused by the injection may be relieved by injecting with cold water immediately, and water should be added to the solution. It should, however, be strong enough to cause a slight tickling or itching sensation, which will subside almost immediately.

By this means cure has been effected in the severest cases in three or four days, and, in some mild ones, in one day. Its use has never been followed by symptoms of stricture, even in those who have frequently resorted to it; nor by testitis, although from the quickness with which the disease is removed, metastasis might be apprehended. It has been found to cause less inconvenience, and to be more efficacious than many other weak solutions, as those of acetate of lead, alum, and nitrate of silver.

The injection may be performed by the patient.

CREOSOTE IN GONORRHŒA.

Creosote, says Dr. Allnatt, in the *Medical Gazette*, has been found efficacious in some diseases of the cellular and mucous tissues, and also of advantage in scrofulous ulcerations of the throat and limbs, in aphthous affections of the mouth, and in some cutaneous disorders. It has been successfully employed by MM. Reichenbach, Künckel, Lessere, and other Continental physicians, in chancres and other syphilitic sores.

Creosote, being of an oily nature, does not mix with water; and as it is but slightly soluble, the watery solution is not powerful enough in most cases: it has been found, however, very efficacious in some wounds and ulcers.

The following formula, whether as an injection or to be taken internally, has been found highly useful; the alkali gives solubility to the creosote, without injuring its properties.

Injectio creosoti.

℞ Creosoti, Liq. Potassæ; āā. ʒi.
Sacch. alb. ʒij.

Tere simul in mortario; Mist. Camphoræ ℥vj. tum adjice paulatim.

In gonorrhœa in the male, after the acute stage, let a very weak injection be used at first; 10 minims of creosote in ℥vj may be sufficient at the commencement; and, should it be necessary, may be progressively increased to the above-mentioned quantities. If irritation be induced, the proportion of creosote should be lessened.

Creosote might, perhaps, be used with advantage in refractory cases of gleet.

PREPARATION OF MERCURIAL OINTMENT.*

Take two china pans of different sizes; put snow in the larger with a little common salt, to lower the temperature still more. Put above this the other pan containing the mercury with half the grease which it is intended to employ. As soon as this mixture is very cold, stir it until the complete extinction of the mercury, which will speedily take place; for, scarcely does the pan containing that metal feel the contact of the frigorific mixture, and we begin to stir, when we see the mercury become incorporated with the grease as if by enchantment. In half an hour the operation is terminated; then the rest of the lard is added. This process is due to M. Mamone Capria.

FATAL EFFECTS OF THE ACETATE OF LEAD GIVEN IN LARGE DOSES FOR PULMONARY CONSUMPTION.†

BY DR. BICKING, OF MÜLHAUSEN.

Although there is a great number of cases extant in which the acetate of lead has been given successfully, or at least without fatal consequences, for pulmonary consumption, there are others in which fatal consequences ensued from the prolonged use of that medicine: on this subject Dr. Bicking cites the following fact:—

Ferdinand R., aged 15 years, subject to scrophulous diseases during his youth, experienced various symptoms near the organs of the breast, and at length went into a consumption. Having arrived at a very advanced stage of that pulmonary affection, with hectic fever, sweating and colliquative diarrhœa, nothing being able to arrest or amend the progress of the disease, Dr. Bicking tried the exhibition of acetate of lead.

I gave, he says, to the patient a quarter of a grain of acetate of lead, with powdered sugar of milk, four times a-day, for a certain time. Under its influence I obtained a remarkable amendment in the progress of the morbid symptoms; the fever, the sweats, the looseness, and the cough abated. The purulent expectoration also diminished, without the impression increasing. This favourable result induced me to continue the treatment, and for six weeks I increased gradually the dose of the medicine; so that at length the patient daily took two grains of acetate of lead.

At this period the patient experienced a a remarkable improvement, disturbed, however, from time to time, by some recurrence of the general symptoms which had been amended; at each relapse I employed the same means with success. After twelve weeks, all trace of consumption had disappeared, and the child, having returned to school, was no longer under any medical treatment. He had taken, during the course of the disease, almost 130 grains of acetate of lead, without any poisonous, or even injurious effect.

However, he could not be completely reestablished; he remained weak, thin, pale, with a frequent pulse, frequent want of breath, pains in the breast, and an obstinate irritating cough. I apprehended lest a new attack of phthisis should carry him off in a few moments. My fears were realized, but in a different manner.

A month afterwards he lost his appetite by degrees; the lower bowels were painfully contracted; the stools were rare and painful; the skin became all over the body of a bluish yellow; the face was swelled and heated; the hair fell off; a convulsive cough soon came on, accompanied by great difficulty of breathing, and by burning pains in the breast, which was succeeded by partial paralysis of the feet. This state lasted fourteen days. One night a violent attack of fever manifested itself, with heaviness of the head, paralysis of one of the eyelids, convulsions of the face and extremities.

All remedies were powerless; the patient was in bed, without consciousness, in an insensible state, or delirious. He died the third day. A *post mortem* examination could not be made.—*C. W. Hufeland's Journal des Pratischen Heilkunde,* March and June, 1839.

The publication of this notice ought not, however, to make it be understood that acetate of lead, employed medically, always has fatal results. We believe that it is necessary to study further the therapeutical action of that acetate; we know that we have found great advantage in that salt in many cases; and we have seen Dr. Bricheteau give pills of acetate of lead to Mademoiselle C.S., who was considered as attacked with phthisis. That treatment was followed by the greatest success; and Mademoiselle C. S. is now married, and has several children, and enjoys perfect health.

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* *Gazetta di Chimica Pharmaceutica.*

† *Journal de Chimie Médicale,* Feb. 1840.

POISONING BY ACONITE.*

It is known that *Aconitum Napellus* is a violent poison. Mathiole, Pallas, and other authors have communicated cases of poisoning by that plant, which is found in our gardens as an ornament. The following is a further example of its danger.

At Suippes (Marne), a child twenty-one months old, full of spirits, was taken into a garden by its mother, and stopped beside a plant of *aconitum napellus*, a very poisonous plant, of which the vulgar name is *monk's hood;* he plucked a branch, and took from it some leaves and two or three flowers, which he swallowed. His mother, engaged on the other side, immediately perceived this, and although quite ignorant of the injurious properties of the plant, she took it from him and threw it away. Unhappily it was too late; in half an hour the child began to totter, his face became animated, and he was soon unable to stand. At first, his parents thought that some neighbour had given him wine, and they did not feel much alarm. However, as the symptoms were growing stronger and stronger, and as the little patient complained continually of a pain in the bowels, a physician was sent for, being about two hours after the first manifestation of the pains. He immediately recognized the symptoms of poisoning, and hastened to administer to the child an antidote, some spoonsful of an emetic draught, of which the effect was to provoke vomiting immediately. But this aid had, unfortunately, been too tardy; just as the infant was receiving some spoonsful of the same draught, the physician saw his eyes become convulsed, his jaws lock, the trunk stiffen and curve backwards, and the limbs move convulsively. Five minutes afterwards the child had ceased to live.

POISONING BY ESSENTIAL OIL OF BITTER ALMONDS.

OBSERVED BY M. CHAVASSE.†

M. .... druggist, had put a bottle of essential oil of bitter almonds into a drawer, without a label, beside another bottle not labelled, and containing dulcified spirit of nitre. He was in good health, but from time to time suffered nephritic pains. Having experienced a strong attack of these pains, he ran hurriedly to get the bottle of spirit of nitre, and took a half-oz. draught; but unfortunately he had inadvertently taken the bottle of oil of almonds instead of the other. He immediately perceived his error, and sent for his physician. Half a minute afterwards, he grew pale, fell into syncope, became convulsed, his face assumed the paleness of death, and his pulse was imperceptible.

M. Chavasse arrived without delay; he found the patient on the bed. The syncope had gone away some minutes afterwards, and he had been laid down: he immediately threw up a good deal of food, and bile smelling strongly of prussic acid. Mortal paleness, general cold; pulse at first small, frequent, intermitting, afterwards slow and regular. Subdelirium; the patient stammered incoherently; convulsive movements, chiefly of the eyelids; afterwards the sardonic grin; countenance gay, eyes brilliant, breathing short and panting; attacks of suffocation; convulsive fits. M. Chavasse sent for a stomach pump, but not being able to get one, he made the patient vomit by means of hot water and sulphate of zinc, which he gave to the amount of three drams. At the same time he applied himself to restore heat to the body by bottles of hot water and hot linen; but he did not lose sight of the essential point, after vomiting, the exhibition of stimulants. Accordingly he gave the patient to drink a mixture of brandy and ammonia, diluted with water. The improvement was instantaneous, the pulse, heat, and other functions recovered by degrees, and the patient passed from death to life. The following draught was continued; Ammonia, 1 dram; tincture of cardamom, 1 oz.; camphor mixture, 7 oz. The patient was cured. (*Gazette des Hôpitaux*).

It is desirable that the authorities should pay some attention to the shops of the wholesale perfumers and druggists, who sell by the ounce as a perfume to all makers of pomatum, that *essential oil of bitter almonds;* an oil which is a violent poison on account of the hydrocyanic acid contained in it. We have examined an ounce of it which had just been purchased by a hairdresser, and have convinced ourselves of the fact.

SUSPICION OF POISONING.

REPORT ON THAT SUBJECT.‡

In pursuance of further directions on the subject of D . . . . . , we, Jean-Baptiste Chevallier, and Stephen Ossian Henry, chemists, members of the Royal Academy of Medicine, have been charged by an order, made the 11th of February, 1837, by M. Michel-François Dieudonné, Judge of Instruction to the Tribunal of First Instance for the Department of the Seine, to proceed, on oath, to the chemical examination *of divers coloured papers*, seized at the residence of M. D . . . In consequence, on the 1st of March, we proceeded to the laboratory of one of us, and there, after having taken oath before the Judge of Instruction, to fulfil faithfully the commission intrusted to us, he put into our hands *fifteen bits of paper of different colours*, seized at the former residence occupied by the married couple D . . . . , on occasion of a visit to that domicile, made on the 21st of January, 1837, by M. Lhuillier, Commissary of Police of the Commune of Montrouge, Officer of Judicial Police in aid of the King's Attorney.

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* *Journal de Chimie Médicale*, Feb. 1840.

† *Journal de Chimie Médicale*, Feb. 1840.

‡ *Journal de Chimie Médicale*, February, 1840.

These pieces of paper were contained in a sealed sheet of paper, bearing these words :—*Commune of Montrouge (Seine), Commissary of Police;* and ticketed thus: No. 3, *Commissariat of Police of Montrouge, fifteen pieces of paper of different colours, seized at the old residence occupied by the married couple D . . . . (See our report of the* 21*st January*, 1837*). Signed, A. Chevallier and Lhuillier.*

The pieces of paper here mentioned were composed,—1. Of two leaves of yellow paper, coloured on both sides; 2. Two leaves of orange-red paper, one spotted in several points, the other having these words in print : (*Grande fabrique de cirage Anglais* (English wax works), *rue de Paris No.* 81, *à Belleville : Beraud, fabricant de cirage ;* 3. A very small leaf, with printed characters ; 4. Lastly, 10 strips of glazed apple-green paper, and coloured only on one side.

CHEMICAL TRIALS.

First trial.—Yellow paper.

This paper, pretty thick, of a canary-yellow, not glazed, spotted with brown splashes, was divided into several narrow slips, and calcined in a new Hessian crucible, with a certain quantity of alcohol and potassa. The residue, taken up by pure water and filtrated, was of a yellowish colour ; its excess of potassa was saturated with acetic acid, and by then adding to the liquid a soluble salt of lead, a yellow precipitate was obtained, which further experiments proved to be *yellow chromate of lead.* The paper was, therefore, coloured by chrome yellow.

Second trial.—Orange-red paper.

A part of this paper, submitted to nitric acid, then a little diluted with water, instantly assumed a brown colour, afterwards that tint disappeared ; the liquid acid part, increased by a good deal of water, gave, with sulphate of soda, a white precipitate slow in its formation ; with hydro-sulphuric acid it gave a black sediment, &c. ; on the whole, all its properties belonged to a compound, with lead for its base. The action obtained by nitric acid, and the orange-red colour of the paper, indicated the presence of minium.

To leave no uncertainty as to the nature of a compound of lead, in the colouring matter of that paper, we calcined briskly a small part in a new china crucible, and the residue was submitted to pure nitric acid ; the acid liquid, racked off with the greatest care, furnished, after a slow evaporation, crystals of *nitrate of lead*, the nature of which it was impossible to mistake.

The paper was, therefore, really coloured with *minium* (deutoxide of lead.)

Third trial.—Paper with printed characters.

This little leaf, having some printed marks, of a bluish tint, presented nothing particular. The colour was given by a compound containing indigo.

Fourth trial.—Green paper.

The ten slips of glazed apple-green paper, seized with the preceding fragments, at the former residence of the married couple D . . . . (Rue de Vanvres, Commune of Montrouge), have been examined carefully.

This paper, put into the flame of a candle, burned with a smell of garlic, not intense, indeed, but yet easily recognised.

Being plunged, for about twelve hours, in a diluted solution of pure ammonia, it furnished a sky-blue liquid, which was filtered and evaporated with a mild heat in a glass capsule.

The residue, after this operation, was *deep apple-green*, pulverulent, almost insoluble in water, making no effervescence with the acids, giving out, on lighted charcoal, a very distinct smell of garlic ; lastly, being submitted to pure hot nitric acid, it was transformed into a soluble salt, which gave, by means of nitrate of silver, a brick-coloured precipitate of *arseniate of silver*, from which it was easy to isolate the metallic arsenic, by means of reduction with charcoal.

The green colour of that paper was, therefore, given by *arsenite of copper* (Scheele's green), employed frequently for that purpose.

Summary.

The different specimens of coloured paper submitted to our analysis, received their colour, therefore :

1. *From the yellow chromate of lead.*
2. *From minium (deutoxyde of lead.)*
3. *From a compound containing indigo.*
4. *From arsenite of copper (Scheele's green).*

Inferences.

The absence of arsenic, in the results of the analysis of the stomach and bowels of M. D . . . , does not admit the supposition that the *green-colouring matter*, of the trial of No. 4, could have caused the death of that individual. As to the presence of lead, which metal has been detected in the viscera of D . . . . after his death, and by means of analysis, it would be difficult to imagine that the papers thus coloured, particularly those coloured by *minium*, had poisoned him, seeing the difficulty of making a person take such substances without knowing it; but it would not be beyond probability, that the lead found in the dead body of M. D . . . . , should have come from the remains of such papers, which might have served for burning, and of which the metallic residue might have been in the ashes, of which a part was introduced into his organs after the autopsy, as has been said in a preceding report.

DR. DEGLAND'S PURGATIVE DECOCTION FOR LEAD COLIC.*

Senna .	64 grammes	(2 ounces)
Sulphate of soda	32 do.	1 do.
Syrup of buckthorn	64 do.	2 do.
Water . .	500 do.	(1 pound)

Make *secundum artem* a purgative decoction, a glass of which is to be administered to the patient every half hour.

M. Degland, physician to the hospital of the Saviour at Lille, who has charge of the workmen at the factory of Theodore Lefebvre, of Moulins-les-Lille, has had great success with this decoction.

DRYING THE PETALS OF THE WILD POPPY.†

BY M. HUNOULT DESFONTENELLES.

The petals of wild poppy are ranged on leaves of paper, covering only the halves of the paper leaves, as that the paper may be doubled, and one part cover the petals. This arrangement having been made, the leaves thus charged are placed either on a shovel to put them in an oven, or on a sort of basket, in order that there may be a greater number of leaves; then with a shovel for putting bread into the oven the paper leaves or the basket are placed on the flat bottom of a baker's oven, or of a domestic oven which has just been employed in baking bread; they are left in the oven for a space of time, from one to two minutes, and are then withdrawn. If these petals be examined, it will be seen that the desication is complete. The petals thus dried preserve their colour perfectly, and are not liable to roll up as when they are dried in a stove; moreover they preserve their beautiful colour better.

FORMULÆ FOR LOZENGES.

BY MR. BARTLETT.

To the Editor of The Chemist.

Sir,—I herewith send you a few of the formulæ for lozenges, and if approved of, will communicate more.

TROCHUS ANISI.

3 lb. sugar powdered; 3 drams of umber; 50 drops of oil of aniseed, with a sufficient quantity of thick mucilage to form a very stiff mass. This is then to be rolled out to the required thickness, and cut with a tin mould or cutter, allowing them to remain on a tray in a warm place until dry; sometimes they are rolled out in the shape of the Bath pipe.

CAMPHOR LOZENGES.

3 lb. finest powdered lump sugar; ½ dram of Smalt's blue; 1 oz. camphor dissolved in a little spirit of wine, and mixed with mucilage (the whiter the better); and proceed as before directed.

CINNAMON LOZENGES.

4 lb. powdered sugar; 12 grains of drop lake; 2 scruples of gamboge; 60 drops of oil of cassia mixed with mucilage, as before.

BLACK CURRANT LOZENGES.

3 lb. sugar powdered; 3 lb. extract of black currants; 1 oz. tartaric acid; 6 oz. *powdered* gum; mixed, rolled out as before, and cut when *dry*, with a pair of large scissors, into square pieces.

IPECACUANHA LOZENGES.

4 lb. powdered sugar; 1 oz. ipecacuanha powder; 4 drops of otto of roses; mucilage acacia q. s.; ft. *Troches.*

IPECACUANHA WITH TOLU.

The above with ½ oz. tincture of tolu, and 2 oz. of finely powdered cream of tartar.

Fearing you may not have room for more, I wait till next month; but should any of your readers wish for any particular form of lozenge, I shall be happy to give it, if in my power.

Can you or any of your readers inform me if Mr. Warburton is going on with the Medical Bill? I sincerely wish, with you, in your note respecting a letter from Mr. Phillips, of Luton, that there was a school formed in the metropolis for the study of chemistry and pharmacy, for I am grieved at the small amount of chemical knowledge possessed by druggists generally.

Britten Terrace, Chelsea.

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* *Journal de Chimie Médicale*, Feb. 1840.

† *Journal de Chimie Médicale*, Feb. 1840.

LOZENGES OF LACTATE OF IRON.*

M. Bouillaud made a report concerning the lozenges of citrate of iron prepared by MM. Gelin and Conté, apothecaries to La Charité. These young chemists, considering that the ordinary ferruginous preparations are dissolved by the lactic acid which forms part of the gastric juice, and thence carried into the system, have proposed to introduce ready prepared lactate of iron into the digestive passages. M. Bouillaud and M. Fouquier have tried the medicament in question, and their results agree perfectly. From the first 8 days' appetite becomes excessive, and at the end of from 15 to 20 days the symptoms of chlorosis have entirely disappeared.

DESCRIPTION OF AN APPARATUS TO MAKE CAPSULES OF GELATINE.

BY M. HUNOULT DESFONTENELLES.

The swimming bladder of a tench or any other fish is taken. Fishes from five to seven inches long give suitable bladders ; it is fixed with fine thread at the end of a copper tube, and the ligature covered with a small pipe ; the middle part of the tube contains a little valve opening downwards. Underneath is a little hole closed by a small key. By breathing through the extremity of the tube the bladder is distended, and remains in that state, since the valve, which is closed by the effort of the air breathed in, prevents that air from coming out. A solution of gelatine is prepared similar to that proposed by M. Garot to cover pills with gelatine. (See the *Journal de Chimie Médicale* for March, 1838.) The bladder is impregnated with lard, to prevent the gelatine from adhering to it, and it is plunged in the solution, so that it may be well covered with gelatine. It is withdrawn, the tube is rolled between the fingers, in order that the solution may be spread uniformly over the distended bladder, and it is allowed to cool. When the cooling is complete, the capsule fixed at the bottom of the tube is detached, by making an incision round with a penknife. The hole is opened, the air escapes, and the mould may be easily withdrawn, since being deprived of the air which distended it, it may be folded up. With seven or eight of these moulds a great number of capsules may be prepared, particularly in cold weather.

Instead of the swimming bladder little moulds might be employed made with gold-beaters' skin, or with gauze varnished with caoutchouc. A small clay mould might be made with a quill fitted to it, and afterwards left to dry. The mould might afterwards be covered with the gauze or skin ; and this fixed with thread on the quill, and several coats of varnish applied. When the varnish became dry, the clay might be got out by the opening, and the mould afterwards fitted on the apparatus.

The employment of swimming bladders may be made still more simple ; we may condense the air by urging the piston into the tube. This condensed air would distend the bladder ; when the coat of gelatine was dry, the piston might be withdrawn ; the bladder would then become flaccid, and the capsule might be removed.

ON THE PRESERVATION OF SUBJECTS, FOR NORMAL AND PATHOLOGICAL ANATOMY, WITHOUT ALTERING THE COLOUR OR DENSITY OF THE TISSUES.†

BY DR. CH. DUJAT.

Hitherto, no method had been discovered of resisting the putrefaction of animal substances, without changing the appearance of the tissues ; the aluminous injections, although they have rendered real services in latter times, spoil the instruments and give to the muscles, vessels, and nerves, an uniform white tint which does not admit of their being easily distinguished ; accordingly, the use of them has not become so general as might have been thought.

It is, therefore, an object of interest to know an easy process to prevent putrid decomposition, without at all changing the appearance of the parts. In countries between the tropics, anatomical studies were rendered peculiarly difficult by the rapid putrefaction of dead bodies in all seasons ; but since Dr. R. O'Shaughnessey has tried, for dissections, the arsenical injections recommended by Dr. *Tranchina*, of Palermo, to preserve dead bodies, anatomical studies have been pursued in the native medical college at Calcutta, even with more facility than with us.‡

Last winter, and also recently at the practical school of Paris, I have injected several subjects by this process, and the success has been complete ; the brain, after several weeks, was as firm as it was found on the autopsy; the pathological alterations of the different organs had retained their usual appearance. An arm, injected with an arsenical solution last March, was kept in a closed place to retard its desiccation; three months afterwards it was in a state of perfect preservation, and might have been still dissected: it has been completely dried since,—the muscles are of a deep red, without any other alteration of colour. On the 11th of last October, I suspended the already advanced putrefaction of a body by the arsenical injection; and I still (26th November) preserve parts which present no other difference from those taken from a subject a few days dead, except the detachment of the epidermis. Pieces in a state of putrefaction, macerated in that liquid, have lost their smell, and have been very well preserved.

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* Royal Academy of Medicine, sitting of the 4th of February, from *L'Experience*, Feb. 6, 1840.

† *Journal de Chimie Médicale*, Feb. 1840.

‡ This Institution, founded of late years for the medical education of Natives, has 100 pupils. The zeal and intelligence of the young Hindoos, and the judicious plan of study, give us reason to expect that it will send forth soundly educated medical practitioners.

The advantage of this process for anatomical preparations, and for desiccators in that department, is easily conceived; since even specimens of pathological anatomy thus retain their primitive appearance until the drying is complete.

This means is also valuable for the preparations of skeletons with the ligaments; it is sufficient to give them several coats, or (which is better) a bath of the hot solution of arsenic, to protect them from insects, and to preserve the bones. As the arsenical injection, if driven with sufficient force, penetrates all the tissues, it also affords, for preserving the skins of stuffed animals, a much more certain means, since the operation will have been performed before the animal has lost all its heat.

I had thought that Dr. R. O'Shaughnessey was the originator of this mode of preserving subjects for anatomical studies by arsenic acid; but I have since learned that Professor Dudley, in the United States, has, for more than fifteen years, injected in this manner the subjects submitted for dissection in the school at Levington. Chaussier himself appears to have employed this process to preserve dead bodies.

The poisonous properties of arsenic might create fear in rendering this mode common; accidents have happened to men who had their hands for several hours bathed, and as it were, macerated in a solution of arsenic. The same circumstances are not met with in dissection; the hands are not wet with the moisture of the dead body, except accidentally, and for a very short time. On the other hand, the arsenious acid, little soluble when cold, is deposited in a great part in the web of the tissues, and the liquid contains very little of it. The fears manifested respecting the use of this process are, therefore, exaggerated. I am even persuaded that it renders the punctures made in dissection less dangerous; the atoms of arsenious acid, which might be absorbed by the denuded points of the skin, can alarm only homœopathists. The disengagement of arseniuretted hydrogen has been feared; but none can be formed, since the putrid decomposition does not take place. Besides, experience, the best criterion in all things, has demonstrated that these fears are ill-founded; since at Paris, Calcutta, and Levington, numerous pupils have dissected subjects without being injured. On the other hand, I have reduced to 125, and even to 64 grammes, the dose of arsenious acid for the injection of a single dead body, instead of a kilogramme, recommended by Dr. Tranchina.

The following is the process which I employ:—

Arsenious acid in powder .	125 grammes.
Common water	1½ kilog.

I boil for five or ten minutes in an earthen or other saucepan, and, with a domestic syringe, *not greasy*, I inject the liquid by the crural or carotid artery, in which an end of a thick probe has been fixed. As the syringe contains but 509 grammes of liquid, it must be filled three times for the solution of 1,500 grammes. This is to be hot; for as I have said above, the arsenious acid is partly deposited on cooling. It is good to drive the injection with a moderate force, particularly in aged subjects, in order to penetrate the bones, ligaments, and other parts, which receive only small vessels. With subjects which are to serve for angiology, the solution is to be allowed, for twenty-four hours, to penetrate the tissues, and so clear the vessels before making the thick injection; this second operation succeeds quite as well as if the first had not taken place. In ordinary dissections, I have sometimes injected only 64 grammes of arsenic in one kilogramme of water; but this quantity of liquid not being sufficient to penetrate all the parts of a large subject, I have seen those parts, which receive few arterial vessels, affected with worms at some points, and becoming putrid, but never the other parts.

When the subject is designed to be preserved indefinitely, the injection is to be repeated with the same dose a second, and even a third time, at some hours' interval, when the first has thoroughly penetrated the tissues. I have reason to believe that a dead body, penetrated with 367 grammes of arsenious acid, will be always protected from putrid decomposition, in whatever place it may be deposited.

The solution of deuto-chloride of mercury is not a sure means of preservation; this salt finally passes into the state of a protochloride, and even is restored to the metallic state, and in these two cases no longer possesses the same preservative qualities; whereas, all the combinations of arsenic are opposed to putrefaction.

Lately, a solution of creosote has been recommended; and still more recently, Drs. Babington and Rees (*Guy's Hospital Reports*, No. IX., October, 1839, p. 142,) have recommended pyroxalic spirit. These liquids, it appears, preserve subjects very well; but their offensive smell and high price, prevent the general use of them. Arsenious acid has no smell; and the quantity necessary for a subject does not exceed the price of twenty centimes.

MOXON'S EFFERVESCENT MAGNESIA.

This powder is much extolled in England for weakness of stomach, indigestion, nausea, &c. It is sold at a very high price. M. Durand thinks that it may be very well imitated in the following manner:

Carbonate of Magnesia	1 P.
Sulphate of Magnesia	āā 2.
Bicarbonate of Soda............	
Tartrate of potash and of Soda ..	
Tartaric acid	

All these salts are employed free from water of crystallization, pulverized and kept together in a bottle hermetically closed, protected from all moisture. The dose is a spoonful in a glass of water, to be drunk at the moment of effervescence.—*American Journal of Pharmacy.*

Fluid Magnesia.—To form the solution of bicarbonate of magnesia, the following process is to be adopted:—Put one pound of common carbonate of magnesia into a Woulfe's apparatus, say half into each of two bottles; then pour into each about a quart of water; and afterwards pass a stream of carbonic acid gas, made in any cheap manner, into the magnesia, continuing it for some time. The carbonic acid will dissolve the magnesia, which can be poured off clear from any that remains undissolved; and this, with fresh water poured upon it, can be subjected to a second operation with the stream of carbonic acid. The proportion of water is about one ounce to fifteen grains of the bicarbonate of magnesia

PRIZES PROPOSED.*

The Society of Medicine of Bourdeaux puts to the concourse the following questions:—

1st. *To investigate, by chemical analysis, the active principles of the root of the wild pomegranate, and to confirm by clinical facts their therapeutical virtues.*

The prize is 200 francs, to be decreed in 1840.

2nd. *Is varioloïd a new disease?*

Is varioloïd a distinct disease, or a simple modification of variola.

To illustrate these facts by observations.

The prize is 300 francs, to be decreed in 1840.

3rd. *To make known the alterations which distilled waters in general may undergo, particularly those of orange flowers, mint, melissa, and the cherry laurel; to point out the chemical causes of these alterations. Is there a general method of preserving distilled waters? Is there one for some among them?*

The prize is 300 francs, to be decreed in 1841.

4th. *To determine, by clinical facts, anatomico-pathological investigations and chemical analysis, the differential characters of diseases of the osseous system. To say if these diseases have not natural differences more fundamental than those of their form. To deduce from it the therapeutical rationale.*

The prize is 400 francs, to be decreed in 1841.

The memoirs, very legibly written, in Latin or French, should be sent, post free, to M. Burguet, General Secretary to the Society, Rue Fondaudége, Nò. 41, before the 15th of June of the year in which each prize is to be decreed. The competitors are required not to make themselves known; they must distinguish their memoirs by a sentence which will be repeated in a sealed note containing their names and their addresses, or those of their correspondents. If these conditions are not complied with, their works will be excluded.

TO CORRESPONDENTS.

Nota Bene.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London."*

We are greatly indebted to Mr. Muspratt for his communication.

To Mr. Tuff we are much indebted for his suggestions, which shall not be lost sight of.

With Mr. Stuart, the Editor entirely coincides as to advocating the reforms alluded to. A leading article is not usual in a monthly philosophical journal; but our columns are open for reception of well written and powerful articles on the subject of chemical reform, or of medical reform, as affecting chemists.

The Buranhem, or Monesia, may be procured at Messrs. Savory and Moore's, New Bond Street.

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* *L'Experience,* Feb. 6, 1840.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE REPRODUCTION OF CHROMIC ACID FROM THE MURIATE OF PROT-OXIDE OF CHROME BY MEANS OF PER-OXIDE OF LEAD.

BY CHARLES WATT.

In some recent operations, I have had occasion to employ large quantities of chromic acid in combination with muriatic acid, a compound which I have formed by decomposing the bichromate of potassa with muriatic acid, or with the chloride of sodium decomposed by sulphuric acid.

As in certain processes of the arts, this compound is employed in contact with vegetable and animal substances, it is almost superfluous to inform chemists that it undergoes complete decomposition, and is converted from chromic acid $\dddot{Cr}$ to the green or prot-oxide of chrome $\dddot{Cr}^2$, which is held in solution by the muriatic acid, forming a muriate of prot-oxide of chrome.

As, however, the chromic acid is a somewhat expensive substance to be employed in large quantities, it is of great importance to recover it, so that it may be used in repeated operations, or be formed into compounds adapted for useful purposes in commerce and the arts.

I made many attempts to recover it. The common method employed for the formation of chromic acid from the native chromate of iron, of course readily suggested itself; but this was attended with many inconveniences and much expense, besides being very troublesome. I therefore, after numerous trials, adopted the following process.

I found that when the per-oxide of lead was introduced into a solution of the muriate of prot-oxide of chrome, and heat applied, decomposition took place; a beautiful yellow chromate of lead was formed; and the green liquid muriate of prot-oxide of chrome was rendered clear and colourless.

Finding it necessary to form some plan of making the per-oxide of lead in large quanties, I was induced to try first the subjecting the deut-oxide, *i. e.* red lead, to the action of nitric acid, which converts one part of the red lead into per-oxide, and another part into the nitrate of prot-oxide.

This, however, is a rather expensive and troublesome process, as it requires repeated washing; and even when washed repeatedly, I found some evidences of nitric acid remaining; for when the per-oxide was mixed with the green muriate of prot-oxide, and heat was applied, a very pungent gas, affecting violently the eyes and causing distressing cough, was given off. This gas I found to be the chloride of azote.

I therefore formed the per-oxide of lead by passing chlorine gas through the deut-oxide covered with water in a Woulf's apparatus, and found it even to possess advantage over every other method of procuring it.

The next step, in reducing the muriate of prot-oxide of chrome, is to put into it a given quantity of puce or per-oxide of lead, and apply heat by steam or otherwise, when the puce colour of the per-oxide will soon begin to change to a white chloride, and from that gradually to a beautiful yellow chromate of lead, and by continuing the heat, and adding more per-oxide of lead, or if this latter is in excess, more green muriate of prot-oxide* of chrome, the operation will be completed.

By this means, the whole of the muriate of prot-oxide of chrome is converted into the chromate of lead, and this so perfectly, that after being washed repeatedly in hot water, and dried, it is fit for use as a pig-

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* It is necessary to remove the supernatant liquor while hot, in order to carry off all muriate of lead, as this is soluble in hot water, but not in cold, and therefore becomes mixed up in the chromate of lead, and, in addition to wasting the chloride of lead, causes the chromate to become rough and gritty.

No. 5.—Vol. I.—May.

ment, or for any other purpose to which it is adapted.

The foregoing process I found, after repeated trials, perfectly to answer all the purposes for forming, from the muriate of prot-oxide of chrome, the yellow chromate, or red di-chromate of lead, and thus saving the loss of chromic acid, which in all large operations is of very great importance, as it is very extensively employed in Manchester and other manufacturing districts.

OBSERVATIONS CONCERNING TARTARIC ACID.*

BY M. BERZELIUS.

Frémy has published his experiments on the modifications which tartaric acid undergoes by heat; I mentioned them in my last report, p. 264, wherein I could show only the principal results. Tartaric acid partakes the property, with phosphoric acid, of changing capacity of saturation under the influence of an elevated temperature. We cannot naturally discover by experiments the causes which bring these changes about; we must be content with simple reasoning.

The reasoning which, in my opinion, appears most plausible is this:—in an anhydrous acid the elements are probably grouped in the simplest manner, and in hydrated acid they are so in an apparently different manner. I take the liberty of repeating that which I said in the report of 1837, p. 132. It is more than probable, that the three atoms of oxygen in anhydrous sulphuric acid are grouped together so as to form a triangular diagram, and that the sulphur is placed above, so that the four atoms form between them a regular tetrahedron. On the other hand, it is clear that in hydrated sulphuric acid and the sulphates, the three atoms of oxygen of the sulphuric acid and that of the base form between them a square, while the atom of sulphur is found on one side of this diagram and the atom of the radical of the base on the other, so that the six atoms form together an octohedron. Whether it be really so or not, it is no less evident that the relative position of the atoms cannot be the same in both cases. I have availed myself of this manner of representing this subject only as an example which, were it stripped of all truth, might nevertheless throw some light on the idea which I wish to express, as well as if it were perfectly accurate. In the combination $H + 2\dddot{S}$ the relative position of the atoms should again be different; in a word, for every change in the proportions of combination, there should be a change in the relative position of the simple atoms. If we suppose that this latter combination be composed as the formula $\dddot{S} + \dddot{S}\dot{H}$ expresses, the atoms of oxygen in $\dddot{S}$ should change position, if $\dot{H}$ enters into this combination. If the affinity on which depend the modifications of the proportions of the combination be strong, there will immediately take place a change of position, as in sulphuric acid; the change will be effected slowly if this affinity be weak; indeed, if very weak, it often does not occur at all; whence it results that in this case the relative positions of the atoms are maintained with a force greater than that of the affinity. Let us suppose for a moment that sulphuric is a very weak acid, or that we have a very weak acid to which might be applied that which we have just said of the relative position of the atoms of sulphuric acid. Let us designate this weak acid by the formula $\dddot{R}$. It is evident that in the combination $\dot{H} + \dddot{R}$, the atoms of hydrogen may be exchanged with the greatest facility for the atoms of a more powerful basic radical, without deranging the position of the other atoms; we shall thus have $\dot{K}\dddot{R}$, $\dot{F}e\,\dddot{R}$, &c. &c. The same thing occurs with $\dot{H} + 2\dddot{R}$; we shall then have $\dot{K}\dddot{R}^2$, $\dot{F}e\dddot{R}^2$, &c.; but if an atom of water, potassa, or oxide of iron be introduced into this combination, it will then be necessary that a change in the relative position of the other simple atoms be operated, which requires time. $\dot{K}\dddot{R}^2$ may also be for a long time mixed with $\dot{K}$; $\dot{K}$ may even be separated from it, before the transposition has had time to make considerable progress. But let it act for the required time, the transformation takes place, and $2\dot{K}\dddot{R}$ is obtained from $\dot{K}\dddot{R}^2$.

Let us suppose that $\dddot{R}$ is fixed; by heating $\dot{H}\dddot{R}$ to a certain temperature, the tension of the water becomes stronger than the affinity, and the water escapes, until there remains only $\dot{H}\dddot{R} + \dddot{R}$, wherein the position of the atom is gradually changed according to circumstances; indeed, if even the last half of the water is gone, the atoms will be grouped so as to form $\dddot{R}$. It is probable that, during this operation, chemical combinations are formed and destroyed, *de novo*, such as $\dddot{R} + 3\dot{H}\dddot{R}$, $\dddot{R} + 2\dot{H}\dddot{R}$, $\dot{H}\dddot{R} + \dddot{R} + 2 + 3 + 4 + 6 \ldots\ldots\ldots \dddot{R}$, before the water is entirely driven off. If water be now added to $\dddot{R}$, a new arrangement in the grouping of the atoms commences, there are gradually formed small quantities of $\dot{H}\dddot{R}^2$, and at length, when the number of fixed atoms of water equals that which may be combined with $\overset{:\cdot:}{R}$, $\dot{H}\overset{:\cdot:}{R}$ is formed. By treating, for example, $\dot{H}\overset{:\cdot:}{R}^2$ by potassa, $\dot{K}\overset{:\cdot:}{R}^2$ is immediately obtained, so that the derangement occasioned does not extend beyond $\dot{H}\overset{:\cdot:}{R}^2$; but to form $\dot{K}\overset{:\cdot:}{R}$, there is required, if not as much time as to form $\dot{H}\overset{:\cdot:}{R}$, at least a certain space of time. Many authors, basing themselves thereupon, attribute to water a certain specific action, but it is evident that the same phenomenon would occur with every weak oxidized base, liquid and volatile. That which I have just been saying is a brief detail of the phenomena which tartaric acid, exposed to the action of an elevated temperature, presents, and which, probably, are also presented by other non-volatile acids, and with an inferior energy.

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* *Journal de Pharmacie*, February, 1840.

When a few grammes of tartaric acid are heated (the experiment is less certain of success when too great a quantity is taken, on account of the difficulty of heating the whole mass equally) to 200° centigr. so as to fuse the acid, and maintained at this temperature for some time, we obtain, before the acid has time to be coloured, a modified tartaric acid, which is deliquescent, whose chemical properties are totally different from those of the ordinary acid, which give, for example, soluble salts with lime and baryta. If the acid is dissolved in water, and rapidly saturated with carbonate of lime or baryta, the unmodified acid gives precipitates with these earths, and the liquor retains the soluble salts, which may be obtained by treating it with alcohol, which separates them; nothing then remains but to dry them in vacuo. The isolated acid may be obtained by treating the solution of the salt of baryta with sulphuric acid, filtering rapidly and evaporating in vacuo. It is requisite to operate with rapidity, in order that the tartaric acid may not resume its ordinary form.

Frémy calls this new acid *tartralic* acid. The ordinary acid yields it by losing one-fourth of its water, whence results $4C_4 H_4 O_5 + 3H$, wherein three atoms of water may be changed for bases. This acid does not crystallize, but it forms a viscous and thick syrup. In this condition it may be preserved; but, dissolved in water, it returns in the course of twenty-four hours to the state of the ordinary acid, and more rapidly by the aid of heat. It is soluble in alcohol, but its salts are insoluble in it. The alkalies effect its conversion into the ordinary acid quicker than water. With oxide of lead, it yields a rather soluble salt, which may be obtained by pouring, drop by drop, a solution of the recently prepared acid into a solution of nitrate or acetate of lead, and washing rapidly. If the washing be prolonged for twelve hours, there is obtained on the filter nothing but ordinary tartrate of lead. Frémy has analyzed the hydrated acid and that of the salt of lead; he has also determined the quantity of base contained in the salts of lime and baryta, deprived of their water of crystallization. All these analyses agree with the formula $3\dot{R} + 4C_4 H_4 O_5$; the salt of lead is anhydrous, and the earthy salts contain three atoms of water of crystallization. Frémy considers the acid as a double one, and the salts also as double, composed, in his opinion, according to the formulæ $3\dot{H}C_4 H_4 O_5 + C_4 H_4 O_5$, or $2\dot{H}\overset{:\cdot:}{T} + \dot{H}\overset{:\cdot:}{T}_2$ and $3\dot{R}C_4 H_4 O_5 + C_4 H_4 O_5$ or $2\dot{R}\overset{:\cdot:}{T}. + \dot{R}\overset{:\cdot:}{T}^2$.

If the acid of which we speak be kept at + 180° after it is melted, and it retains its fluidity, it loses a fresh portion of water, and produces $\dot{H} + 2C_4 H_4 O_5$; Frémy distinguishes this last by the name of *tartrelic* acid; it is the same as that which is expressed by the latter terms in the formulæ which we have just given for tartralic acid. This acid is deliquescent, but to a slighter degree than the preceding; it has a little colour, which, however, seems to be a consequence of the prolonged action of heat; it does not crystallize, and dissolves readily in alcohol. When the aqueous solution is saturated with carbonate of lime or baryta, the soluble salt which is formed may be obtained in a syrupy state by the addition of alcohol. Frémy has analyzed the salts of lime, baryta, and lead; their formula is $\dot{R} + 2C_4 H_4 O_5$. When this acid and its salts are digested in water, they return to their preceding states, and from these to that of tartaric acid or tartrates; but the latter remain in the state of bisalts. Instead of the names which Frémy has given to these acids, it would have been more simple to distinguish them by the letters, *a*, *b*, and *c*, as is the case with the phosphoric acids, for they are evidently not different acids, but the same acid, under different modifications, and it may be that these are the same salts chemically combined with a variable number of atoms of anhydrous acid. Frémy adds that, when the operation is interrupted before all the acid is rendered anhydrous, if it is rapidly dissolved in water and precipitated by acetate of lead, the precipitate obtained contains much more acid than enters into the composition of the tartrelates. There is formed, therefore, that which we have expressed by $\dot{H}\overset{:\cdot:}{R} + 2\overset{:\cdot:}{R}$, $\dot{H}\overset{:\cdot:}{R} + 3\overset{:\cdot:}{R}$, &c., in the theoretical examples explained above.

ANHYDROUS TARTARIC ACID.

The above acid having commenced at 180°

continues to lose water until it becomes anhydrous acid of a dark colour. However, a colourless acid may be obtained by heating 15 or 20 grammes of powdered tartaric acid in a porcelain capsule over burning coals. The mass commences by fusing; it speedily attains the above-mentioned modifications, and is reduced, in about five minutes, to a white porous mass, which is anhydrous tartaric acid. This modification of tartaric acid was discovered by Braconnot several years ago. The acid is removed from the capsule, and exposed for some time to a temperature of 150°, in an oil bath. If this last operation is neglected, the acid is gelatinized with water, and is washed with difficulty; while subjecting it to it, it is not attacked suddenly by water, and contains but little tartralic acid. When the washing water no longer reddens turnsole paper, it is pressed in blotting paper, and dried rapidly in vacuo.

It is perfectly pure, has a faintly acidulated taste, is insoluble in water, alcohol and ether. By digesting it in water, it passes successively through all the intermediate states, and is at length converted into ordinary tartaric acid. Alkalies and heat hasten this conversion. By means of sulphuric acid, the two modifications may be produced without the employment of heat: Frémy has not obtained the anhydrous acid by sulphuric acid. He found that paratartaric acid gave in all respects the same modifications as tartaric acid, only it requires a rather higher temperature. The acids which are obtained and their salts have a composition completely analogous to those of tartaric acid; what we have said of the one is consequently applicable to the other; however, the acids are not the same as those of tartaric acid, but are modifications of paratartaric acid, which is reproduced from them by the action of water. This contradicts, therefore, what has been said in a former report, namely, that fused paratartaric acid is converted into tartaric acid by being dissolved in water.

Acknowledgment is due to the author of this valuable work, which has been executed with the greatest care, and the results of which are explained with a clearness which allows theoretical views to be drawn from them concerning chemical combinations which at first sight appear to be so anomalous.

CONTRIBUTION TO THE HISTORY OF THE FORMATION OF EMETIC.*

BY FR. KNAPP.

The formation of emetic by boiling oxide of antimony and cream of tartar in water, according to the known process, requires an explanation, which it has not had until now, while the second product, which is formed at the same time, has not been studied. There is found, indeed, in the supernatant liquor of the crystals of emetic, a salt resembling gum, extremely soluble, and of unknown composition: without knowledge of this composition, it is impossible to give an account of the phenomena of the production of emetic in all their relations.

M. Berzelius mentions this salt (*Traité de Chimie*, vol. v. p. 709), with the observation, "that it contains more oxide of antimony, in proportion to the potassa and the tartaric acid, than the crystallized portion," and that the formation, as well as the cause and circumstances which determine the proportion in which it is found, are yet obscure.

M. Liebig, in his *Dictionnaire*, page 430, says that the salt of the supernatant liquor of emetic is probably only the neutral salt corresponding to emetic,

$$= \bar{T}\,Ko + \bar{T}^3\,Sb^2\,O^3.$$

The following investigations support this last opinion.

The emetic, whose supernatant liquor was examined, had been prepared with pure oxide of antimony, obtained by dissolving antimony in sulphuric acid, and decomposing the salt thus formed by water and carbonate of potassa. After several evaporations of the supernatant liquor, no more emetic crystallizes, and we have, after the complete dissipation of the water, $\frac{1}{6}$ or $\frac{1}{7}$ of an amorphous salt, transparent, of a brown colour, very much resembling varnish in aspect, when in very fine layers, and gum arabic, when in larger fragments. The aqueous solution presents a powerfully acid reaction. It is very difficult to obtain this body in the dry state, on account of its great affinity for water.

If a solution of this salt be mixed with alcohol, an abundant white granular precipitate is formed; alcohol deprives the liquor of colour and reaction. When dried, the precipitate forms a white powder, much less soluble than the gummy salt, which is easily obtained crystallized in very clear octohedra, which is formed of oxide of antimony, potassa and tartaric acid, and is no other than emetic.

The alcohol does not contain either oxide of antimony or potassa; it gives, by evaporation, tartaric acid only.

The salt of the supernatant liquor is, therefore, emetic with more tartaric acid than ordinary. Indeed, if a solution of this acid be boiled with emetic, a much greater quantity is dissolved than the volume of the liquid allows of, and by allowing the excess of emetic to crystallize and evaporate, a gummy colourless salt is obtained, similar to the preceding, with this difference, that it crystallizes very easily, while the former does not crystallize at all, or at all events not for some months, on account of accidental impurities. The colourless crystals, deposited from a solution evaporated to a syrupy consistence, and slowly cooled, present axes inclined towards one another by oblique angles, and belong consequently to forms of a crystalline system different to that of emetic. Slowly heated in a narrow glass tube, they disengage water, become perfectly white, and are then fused into a transparent varnish. Exposed for some time to the air, they lose their transparency and begin to effloresce, but not until the end of three or four hours.

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* *Annalen der Pharmacie.*

When very dry, and yet transparent, they lose in mean, in rarefied air, 9·225 per cent. of water of crystallization. Deprived of this water, they gave by analysis :—

$$\begin{array}{rcrcr} 4\bar{T} & = & 3322{\cdot}828 & - & 54{\cdot}916 \\ 2\,H^2\,O & = & 224{\cdot}958 & - & 3{\cdot}718 \\ K\,O & = & 589{\cdot}916 & - & 9{\cdot}750 \\ Sb^2\,O^3 & = & 1912{\cdot}904 & - & 31{\cdot}615 \\ \hline & & 6050{\cdot}606 & - & 99{\cdot}999 \end{array}$$

The formula of the combination in question is, therefore,

$$3\,\bar{T},\ Sb^2\,O^3 + \bar{T}\,Ko + 2\ aq.$$

The crystals contain five atoms of water of crystallization, which are equal to 9·29 per cent. instead of 9·225, the mean number found. Their atomic weight is, therefore, 6613·01.

The author afterwards examined some anomalies presented by different supernatant liquors of emetic, and put it beyond doubt that they owe their production to the formation of double salts arising from the tartrates contained in them.

He concludes by saying that the gummy salt may be easily transformed into emetic (neutral emetic, which is always obtained by preparing emetic with pure matters). It is sufficient to boil this salt with oxide of antimony, until it dissolves no more of it. We thus obtain emetic and fresh supernatant liquors, which, saturated by carbonate of potassa, yield a fresh quantity of emetic without any ulterior residue.

REPORT CONCERNING M. BOUTIGNY'S MEMOIR, ENTITLED, "PHENOMENA OF CALEFACTION."*

BY MM. ARAGO, PELOUZE AND ROBIQUET.

There is no one but has had an opportunity of remarking the singular effect which water experiences, when it is poured, drop by drop, on a very hot metallic plate ; however, this phenomenon, which is so common, has not yet received any very satisfactory explanation. It may even be added, that until latterly it has attracted the attention of but few philosophers. Eller appears to be the first who has paid attention to it,† but he confined himself to observing and describing it. Leindenfrost, in a treatise entitled "*De aquæ communis qualitatibus*," printed at Duisburg in 1756, says that he had observed that a drop of water poured into an iron spoon heated to redness, is a long time evaporating, and that it forms a globule which turns about, or remains immovable and transparent, like a little crystal sphere. In 1802 ‡ this experiment was repeated by Klaproth : he did it comparatively in capsules of iron, platinum, and silver, and he ascertained that at red heat the length of time occupied by evaporation was not the same in these different metals. Rumford, in order to try and discover the cause of this phenomenon, held the interior of a silver spoon over a candle, for the purpose of covering it with lamp-back, and then poured into it a drop of water, which at the ordinary temperature was formed into a globule, not being able to wet the moistened surface : he could then heat the spoon until he could no longer hold it by the handle, without the drop of water being perceptibly heated. Rumford thought he might conclude from this result that the drop of water reflected the heat, and prevented it from penetrating into its interior. We find, in a memoir read to the Academy in 1825, by our learned brother M. Pouillet,§ the detail of many experiments undertaken with a view to recognize the electricity which is developed in chemical actions, and he relates that he succeeded in half filling with water a large platinum crucible maintained at a white heat, and that he had kept the water in it for a quarter of an hour, without its undergoing any motion or perceptible diminution. This skilful philosopher having remarked that water blackened with ink or fine charcoal powder, evaporated, on the contrary, very quickly, supposed that the phenomenon was probably owing to the facility with which the radiating caloric emanating from very hot bodies, traverses different media ; it might indeed be, adds M. Pouillet, that the caloric carried away by the sides of the heated crucible, traversed the water without being absorbed, and consequently, without heating it as much as less hot rays would have done.

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* *Comptes Rendus*, No. 10, March 9, 1840.

† *Histoire de l'Academie de Berlin*, 1746, p. 42.

‡ *Journal de Physique*, 1802, p. 62 ; and *Nicholson*, vol. iv. p. 202.

§ *Annales de Chimie et de Physique*, t. xxxvi. p. 5.

M. Le Chevallier* has since observed, like M. Pouillet, that in letting water fall, drop by drop, into a red hot platinum crucible, it may be filled and kept a long time in this state without any considerable evaporation; but if the crucible were raised from the fire, the water, from the time that the crucible became below a dull red heat, entered into full ebullition, and was rapidly converted into steam. M. Le Chevallier has seen, moreover, that after having put water into an incandescent metallic vessel, and having closed it accurately with a stopper of the same metal, then opening it after a certain time, that the tension of the vapour had not augmented, and that consequently the temperature of the liquid had not risen, although for some time there had been no loss of steam.

Perkins also remarked that if, after having made a small aperture in a generator, this generator was heated, there was at first a trifling escape of steam, which ceased as soon as the vessel reached red heat.

M. Baudrimont undertook, in 1836,† a series of experiments to demonstrate the inaccuracy of the opinions before him, and he established that all the phenomena observed by M. Le Chevallier might be more easily explained by the evaporation of the liquid. According to M. Baudrimont, the quantity of vapours produced ought to swell up the liquid if it were formed quickly enough to prevent it adhering to the vessel; this liquid can then be heated only by radiation, but is constantly generating steam, which raises its heat by contact, whence it follows that the heat of the liquid cannot be raised much, and that ebullition is almost impossible; for, that it might take place, the liquid must adhere to the side of the vessel which contains it, in order that the steam, being supported by it, might conquer the cohesion of the liquid rather than its adherence to the vessel.

M. Laurent made, in his turn, some experiments which led to still different conclusions. He found at first that a volume of water is volatilized five times quicker in a crucible moistened and cooled, that in a red hot one.

It was generally admitted that water, in these experiments, did not touch the sides of the crucible, and that it was supported by a bed of steam, whence it had been concluded that its ebullition was impossible. M. Laurent says, indeed, that the water does not continually touch the crucible, but he pretends that it oscillates like a ball which is let fall on a horizontal plane. The drop of water, according to M. Laurent, is submitted to a vibratory motion which varies every instant, and this motion is produced by the steam which is formed below every time that the water touches the crucible, that is to say, that the drop of water raised up by the steam falls to be raised up *de novo*, and so on.

The author of the memoir under consideration regards the explanations hitherto given as inadmissible; but, however, he does not propose any other; but he presents this memoir as the prelude of a long work to which he continues to apply himself, and it is to be presumed that when he has collected a great number of observations, he will endeavour to harmonize them, and that he will produce peculiar theoretical views At present our task is confined to mentioning the principal experiments detailed in this first part.

It was generally believed that water could present the phenomenon to which M. Boutigny had given the suitable name of *calefaction*, only at a very high temperature; however, it was produced, in a very manifest manner, in a small leaden crucible.

Now, it is known that this metal enters into fusion at about 260° centigr. It must, therefore, be concluded, with M. Boutigny, that water may be *calefied* rather below that degree; but on setting out from this temperature, *calefaction* (we always avail ourselves of the author's expression) continues to be produced with more or less intensity. M. Boutigny thinks that this phenomenon might perform an important part in the explosion of steam-engines, and he has proposed to make it a subject of especial study.

The author has much varied this kind of experiments, and has subjected successively to *calefaction*, alcohol at different degrees of concentration, ether, the essences of turpentine and lemon, alkaline and saline solutions, acids, &c. M. Pouillet had already studied the effects of this instantaneous influence of heat on the aqueous solutions of baryta, strontia, potassa, and soda, and he arrived at this very remarkable result, that during the time occupied by the experiment, the body which was volatilized and that which remained were in different electrical conditions.

M. Boutigny indicates in his memoir the observations which he has been enabled to make concerning all the bodies which he has submitted to this kind of experiments, and we cannot give them here in detail; but there are some which we may mention, because they have appeared to us of high interest. The Academy will doubtless think them worthy of its attention. One of them relates to ether. M. Boutigny has seen that this liquid, distilled, drop by drop, in an almost red-hot platinum crucible, is calefied as well as water, that it forms itself into a globule without manifesting any sign of ebullition ; it afterwards acts rapidly, and does not seem to wet the crucible. However, it always goes on diminishing, but with much less promptitude than if the vessel were cold. During this slow evaporation, a most penetrating vapour is disengaged, which has nothing in common with that of ether. M. Boutigny at first attributed it to formic acid ; but he is more disposed now to think that it is aldehyde, and indeed there is a great analogy of smell. We have endeavoured to acquire some certainty in this respect, by repeating this curious experiment in a closed apparatus ; but we have been unsuccessful. The product obtained was only ether which had become rather empyreumatic. The author thinks that a current of air is indispensable to the production of this irritating vapour. In operating under the circumstances pointed out by M. Boutigny, we made a very interesting observation : we steeped in the crucible a strip of litmus paper, to ascertain whether this vapour was acid, and we saw that while the portion dipped in retained its colour, that which was in the orifice turned red. The temperature was therefore higher in this part, and it may be presumed that a slow combustion takes place there, analogous to that which is produced in the beautiful experiments of M. Döbereiner, and a more extended study of this curious result will doubtless throw great light on certain phenomena of spontaneous inflammations, for which we could not account.

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* *Journal de Pharmacie*, 1830, t. xv. p. 666.

† *Annales de Chimie et de Physique*, t. lxi. p. 319.

Another experiment of M. Boutigny, which is still more remarkable, is that on anhydrous sulphurous acid. We know the excessive volatility of this acid, and that it can be kept only in hermetically sealed vessels, and that it enters into ebullition to resume the gaseous state as soon as vent is given it. However, M. Boutigny conceived the happy idea of submitting it to *calefaction*, and he has observed that if a few drops of it be poured into a platinum capsule heated almost to redness, this acid gives rise to the same phenomena as the other liquids. It is at first strongly agitated, afterwards forms itself into a globule, becomes motionless, milky, and even seems to be crystallized. If the capsule is laid hold of with a small pair of pincers, and the little spheroïd immediately turned out on the hand, the sensation of cold is experienced. M. Boutigny at first supposed that the sulphurous acid absorbed, during its temporary stability, oxygen from the air, and that it passed to the state of sulphuric acid ; but this idea not being justifiable by the results, he afterwards supposed that the sulphurous acid underwent a great diminution of temperature, in order to become solid. However, as we were aware that M. Bussy had been able to effect this congelation by the prodigious cold produced by moistening the flakes of carbonic acid with ether, it was impossible for us to admit that a similar depression of temperature could occur under such unfavourable circumstances. It was evident, however, that there had been cold ; but all that could be reasonably admitted was, that the evaporation, much less than under ordinary circumstances, produced sufficient cold to congeal, not only the acid itself, but even a portion of the moisture of the surrounding air, and thus determining the hydratation of the acid. Indeed, if the little solid globule is put quickly into a tube, and corked down immediately, it is seen to disappear, but not immediately. There may be observed in the place which it occupied a very perceptible dew, which remains even when the tube is uncorked. However, whether the explanation which we have given of this solidification be the correct one or not, the phenomenon is no less curious, and deserves, in our opinion, very serious attention. This is, without doubt, a fine subject for investigation ; but it will seem just to leave the first fruits to him who has for a long time devoted whole nights to it.

We have the honour of proposing to the Academy, to inform the author of the interest it takes in the first part of his work ; and we request it to engage him to pursue investigations which promise such important results.

The conclusions of this report were adopted.

INVESTIGATIONS CONCERNING THE NATURE AND CONSTITUTION OF AMMONIACAL COMPOUNDS.*

BY DR. KANE.

Dr. Kane had formerly proved that in the combination of chloride of mercury with ammonia, the latter lost an equivalent of hydrogen, and that an amide was the result. He wished to extend his investigations in this point of view to other ammoniacal compounds, which he has lately done in a memoir on the sulphates, proto-nitrate and deuto-nitrate of mercury, ammoniaco-mercurials, and on the ammoniacal compounds of copper and zinc. This immense work, full of cyphers and atomic formulæ, affords but little matter for analysis. We are about to give a succinct idea of the theoretical considerations which the author has deduced from it.

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* *Journal des Connaissances Médicales*, March, 1840.

Ammonia, represented by the formulæ NH^3, has already been the subject of many theoretical speculations. The simplest manner of viewing it, and that which presents itself first, is to consider it as a base combining with acids with certain proportions of water.

M. Berzelius has wished to make it appear that there is no water in these combinations; he has added speculatively to ammonia an atom of hydrogen, and has formed from it a body, NH^4, which he has called *ammonium*, and assimilated to the metals, an oxidized metal in salts with the proportion of oxygen which is attributed to water: thus the sulphate of ammonia becomes *sulphate of oxide of ammonium*, hydrochlorate of ammonia, *chloride of ammonium*, &c. This bold theory, which certain facts supported, was opposed to many others.

Another theory, if not invented, at least completely developed and studied by Dr. Kane, considers ammonia as an amide, amiduret of hydrogen. Amidogen should be a body formed of the same elements as ammonia, minus one equivalent of hydrogen; consequently it is written $N H^2$: it may be combined with metals, and replace chlorine and hydrogen in certain organic combinations. Dr. Kane's ideas are contained in the following propositions:—

1st. Hydrogen, in all its forms, is analogous to certain electro-positive metals; its compounds act like theirs in similar circumstances.

2nd. Ammonia is an amiduret of hydrogen, which should be written $N H^2 + H$.

3rd. Amidogen may be combined with metals; and the metallic amidurets have a singular tendency to combine with the chlorides and oxides of the same metals.

4th. Amiduret of hydrogen may fulfil the same functions as water, or oxide of hydrogen, considered as basic water, water of crystallization, or saline water.

5th. The oxide of ammonium ($N H^4 O$) is an oxy-amiduret of hydrogen: sal ammoniac is a chloro-amiduret of hydrogen.

6th. The ordinary ammoniacal salts combine with those salts of copper and zinc which contain two equivalents of oxide.

* * *

ON FREE HYPO-SULPHUROUS ACID.[†]

BY M. LANGLOIS.

Since the works of Herschel and Gay Lussac on hypo-sulphurous acid and its combinations, nothing new has, I believe, been published on this subject. These philosophers have tried to insulate this acid by decomposing hyposulphite of strontia by the strong acids. Herschel employed sulphuric acid, and M. Gay-Lussac hydrochloric acid with alcohol. But whatever process was used, the acid had but an ephemeral existence; it was immediately transformed into sulphurous gas and sulphur; still it was not pure.

These investigations proved, however, that hypo-sulphurous acid existed, and that, varying the means, it might doubtless one day be set at liberty.

The study of the properties of hypo-sulphite of potassa has led me to the discovery which I have the honour of communicating to the Academy. This salt was obtained by the ordinary method, by acting with sulphur on a solution of bisulphite of potassa. Its physical characters are not the same as indicated by the English chemist and other authors. The form of its crystals is prismatic and not that of needles; it is not deliquescent, and reddens tincture of turnsole. Dissolved in water, and submitted to the action of energetic acids, it does not undergo any alteration. After having poured into this solution an excess of sulphuric acid, the liquid was left alone for several days, and lost none of its transparency. It is worthy of remark, that the supernatant liquor in which the crystals of hyposulphite are formed, produces, with the acids, sulphurous vapours and a deposit of sulphur. The force which determines the crystallization, therefore, seems to modify the constitution of the salt, since the crystals do not act like the liquid which has furnished them.

These observations naturally lead to the experiments made for the purpose of separating hyposulphurous acid from hyposulphite of potassa.

First I employed tartaric acid; I easily obtained a precipitate of bitartrate of potassa, without any sign of decomposition of the liberated acid. I should have persisted in this means, but I preferred availing myself of perchloric acid, which forms with potassa a more insoluble salt than that produced by tartaric acid.

Having dissolved hyposulphite of potassa in cold water, I poured into the solution, by small quantities at a time, perchloric acid. Perchlorate of potassa was quickly deposited, and the liquid remained transparent. With a little attention, it is easy to attain the point at which the liquor contains neither perchloric acid, nor hyposulphite of potassa, but only hyposulphurous acid. It is afterwards filtered, in order to separate the perchlorate.

[†] Academy of Sciences, sitting of the 16th March, from *Comptes Rendus*, No. 11.

The concentration of the acid can only take place at a gentle heat; if the temperature were raised too high, it would immediately be decomposed. To avoid this inconvenience, it is better to concentrate it over sulphuric acid in the vacuum of the pneumatic machine.

The acid thus obtained is liquid and without colour; it has somewhat of a syrupy consistence. There is a point beyond which its density cannot be augmented without part being decomposed. Its taste is strongly acid and bitter; it does not seem very caustic.

Exposed to the air it attracts moisture.

Introduced into a small glass tube and heated, hyposulphurous acid is decomposed at the temperature of 80° centig. Sulphurous acid gas and a deposit of sulphur are produced.

It does not disturb the salts of lime and strontia. The precipitate which it forms in the solution of baryta disappears by adding distilled water or a few drops of nitric acid.

It has no effect on the solutions of the salts of iron, zinc, and copper.

In the salts of lead, it determines a white precipitate which becomes black by heat.

It forms, at first, in the solution of nitrate of silver, a yellowish-white deposit which soon becomes black. Sulphuret and sulphate of silver are produced.

The salts of mercury and platinum are precipitated black.

It acts, evidently, on the different salts, like hyposulphite of potassa.

Nitric acid acts instantly on concentrated hyposulphurous acid; deutoxide of azote is disengaged, sulphur is deposited, and the liquor contains sulphuric acid.

The action of chloric acid is not less remarkable than that of nitric; the decomposition of the two acids takes place immediately with a tumultuous motion. Sulphur and chlorine are manifested, and reagents indicate in the liquor the presence of sulphuric acid. The phenomenon is similar to that which is observed when a few drops of chloric acid are poured into alcohol or ether. In the latter case there is more inflammation of the combustible body in excess.

Chloric acid, whose action on hyposulphurous acid is so powerful, does not act on hyposulphite of potassa.

The employment of perchloric acid, to extract hyposulphurous acid, should make us presume that these two acids may be kept in contact, without being destroyed. Indeed, perchloric acid, mixed with hyposulphurous acid, produced nothing.

Sulphuric acid effects its decomposition by raising the temperature.

Hydrochloric acid has no action on it.

I have not made any experiments directly with the view of establishing the composition of hyposulphurous acid. My researches in this respect have been confined to hyposulphite of potassa. I am almost certain, that in this acid oxygen and sulphur are found in the proportions indicated by M. Gay Lussac. Hyposulphite of potassa, heated on a sheet of platinum or in a glass tube, allows sulphur to escape; the remainder is formed entirely of neutral sulphate of potassa, without either subsulphate or sulphuret. This fact can only be explained by considering this salt as formed of one atom of potassa and three atoms of hyposulphurous acid. Heat would destroy two atoms of the acid, whose oxygen would be carried to the non-decomposed atom in order to form the sulphuric acid retained by the potassa.

The study of the hyposulphites merits, I think, to be resumed, and had it not been for the motives mentioned in the letter which accompanies this Memoir,* I should not have published these investigations until I had paid more attention to this part of the science.

CRYSTALS OF HYDRATED HYDROSULPHURIC ACID.†

BY F. WÖHLER.

There is probably a crystallizable combination of water with hydrosulphuric acid, but which can exist only at a very low temperature, or under high pressure. In a tube containing, in the condensed state, liquid hydrosulphuric acid prepared in the usual way, by the spontaneous decomposition of bisulphuret of hydrogen ($H^2 S^2$) in close vessels, in a short time little transparent crystals were formed, which were colourless, quite different from those of sulphur, and which, in this instance, could only be hydrated hydrosulphuric acid. After it had been kept a year, this tube exploded on being removed from a cold room to a warm one, but in such a manner that it broke only the extremity at which it had been closed; the rest remained entire. I had still time to observe that these crystals were destroyed and disappeared with disengagement of gas immediately after the removal of pressure.

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* This Memoir was accompanied by the following letter:—

"This Memoir is intended to publish the means by which I procure isolated hyposulphurous acid. On the 10th of March, I made a verbal announcement of this discovery to the Society of Natural History of Strasburg. One of the members, M. Oppermann, communicated this fact to Professor Persoz, who came next day to tell me that he had arrived at the same results, but by a different process. This circumstance obliges me, in order to preserve my right of priority, to publish my observations earlier than I should otherwise have wished to do."

† *Annalen der Chemie und Pharmacie.*

Some direct experiments made with a view of producing a similar combination gave the following results:—Water, saturated a 0° with hydrosulphuric acid gas, deposited nothing. A mixture of alcohol and water, which did not congeal at —18°, was reduced to that temperature in a mixture of snow and sea-salt, and saturated with washed hydrosulphuric acid gas. There was very soon formed a crystallization similar to that of ice, but which disappeared with a vivid effervescence, and a production of froth, as soon as the vessel was withdrawn from the frigorific mixture, and held in the hand. Hermetically confined in a tube, the crystallization was not more stable, probably because, on account of the smallness of the quantity, the pressure was not sufficiently strong. But every time the tube was cooled to – 18°, the crystallization was again produced, and I thought sometimes that I distinguished octohedral crystals in it. By using hydrated acetic ether, which does not congeal at —18°, the same phenomena are obtained.

REPORT CONCERNING A MEMOIR BY M. LASSAIGNE, ENTITLED: RESEARCHES ON THE CHEMICAL ACTION WHICH THE METALLIC SALTS EXERT ON LIQUID ALBUMEN, AND ON CERTAIN TISSUES OF THE ANIMAL ECONOMY.*

BY MM. ROBIQUET AND PELOUZE.

The memoir, of which the Academy has charged us to render an account, may be considered as the sequel and unfolding of a former work by M. Lassaigne, on the combinations of bichloride of mercury with albumen and fibrin.

The author has proposed to examine in this new memoir the chemical nature and principal properties of the compounds which result from the contact of certain metallic saline solutions, whether with albumen and fibrin, or with certain tissues of the animal economy. His principal object has been to ascertain by experiment, whether these compounds result exclusively from the combination of animal matter with a metallic oxide, as some chemists affirm, or whether, on the contrary, they contain the elements of the salt unimpaired, as many scientific men think, and particularly MM. Berzelius and Thenard.

Fibrin, gelatine, albumen and caseum never present, as we know, crystalline forms, whether they be considered as separately or in any combination whatever, of which they form part. It seems that nature wished to prevent the serious inconveniences which might arise, in the animal economy, from a tendency to crystallize, in the substances which are spread in it with profusion. The chemical history of these substances is so little known, that not only can it by no means be affirmed that they have been obtained in the free state, but we are still ignorant whether, even neglecting to take account of foreign matters of an inorganic nature which may alter them, they should be considered as peculiar immediate principles or as complex substances. Besides, they do not crystallize, and on the contrary always tend to deprive of that faculty all bodies with which they are put in contact; they are neither volatile nor fusible without alteration; their combustion always leaves ashes, whatever trouble may be taken to avoid them; their solutions are altered with rapidity; moreover, once engaged in combinations, they can seldom be separated without undergoing more or less extensive modifications in their properties. There results from these various circumstances little eagerness, in general, to study the matters of which we are speaking: we are always afraid of operating on impure, indeterminate substances; and without their connexion with important physiological phenomena, no one would devote himself to such a subject. Those who enter upon this obscure part of animal chemistry are therefore deserving of praise, and if, in that, as in other things, accuracy and precision be required of them, it would be, we must say, unjust to ask more than the subject permits.

We have shown the object which M. Lassaigne has proposed to attain. The question with which he is occupied is not only interesting to chemistry; it is still more important to toxicology and legal medicine.

What does a metallic saline solution become in its contact with albumen and animal tissues?

What does a poisonous metallic solution, a salt of copper, for example, become when ingested in the stomach of an animal?

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* *Academy of Sciences*, sitting of the 23rd of March; *Comptes Rendus*, No. 12.

Under what form, in what state of combination is it met with?

M. Lassaigne commences by laying down the distinction which must be established between the effects resulting from the action of certain salts in concentrated solution on liquid albumen, as met with naturally in most of the animal fluids, and the effects which albumen dissolved in a great quantity of water presents.

In the first case, the earthy salts form a precipitate which seems to be entirely owing to a deficiency of solvent; for in the first place, the precipitate is dissolved rapidly in cold water, and in the next place, the same salts do not render turbid albuminous solutions previously diluted with water.

As for the metallic salts, properly so called, which form with albumen true insoluble combinations, they do not make any difference with weak or concentrated solutions of albumen.

M. Lassaigne has experimented with salts of very different nature, with sulphates, nitrates, chlorides, acetates, with salts of lead, copper, silver, zinc, iron and platinum. He has dicovered that albumen is susceptible of being combined with all these salts without eliminating the acids contained in them, and without even modifying their state of saturation. In no case has he been able to recognise a combination of albumen and a metallic oxide, not that such compounds may not exist, but they are formed under different circumstances. According to him, albumen may be combined in definite proportions with metallic salts. By adopting the number, 2387.50, as the weight of the atom of this immediate principle, and representing this quantity by A, the principal combinations of albumen with the salts may be represented as follows:—

$A^6, (Pb\ O)^3, C^4\ H^6\ O^3$ = albuminate of tribasic acetate of lead.

$A^8, Pb\ O, Az^2\ O^5$ = albuminate of nitrate of lead.

$A^5, Cu\ O\ C^4\ H^6\ O^3$ = albuminate of acetate of copper.

$A^4, Cu\ O\ S\ O^3$ = albuminate of sulphate of copper.

$A, Ag\ O\ Az^2\ O^5$ = albuminate of nitrate of silver.

$A^6, Pt\ Cl^4$ = albuminate of chloride of platinum.

It is, however, only with much reserve that M. Lassaigne attributes to the preceding salts a truly atomic composition, and we believe he is right; for even setting aside the sulphur and the small quantity of saline matter which albumen contains, we do not know whether a single experiment can be quoted in support of any atomic formula whatever, for this substance. Moreover, the experiments of M. Mitscherlich, Jun., on the combination of neutral sulphate of copper with albumen, prove that this combination cannot be washed without undergoing decomposition; water perverts it in such a manner, that long before having employed a sufficient quantity for purifying it, supposing it perfectly stable, it is changed into a combination which contains much less sulphuric acid, more oxide of copper, and, above all, much more organic matter.

Again, the proportions of neutral sulphate of copper and tribasic sulphate of copper, found by M. Mitscherlich in the albuminates which he has made known, differ too much from one another, for the cause to be attributed to errors in analysis. They are owing, doubtless, to the difficulty, perhaps impossibility, of obtaining pure salts. These considerations, and many others, which we will pass over in silence, authorize us in believing that definite proportions, if they exist in the compounds of which we have been speaking, are far from having been sufficiently established by experiment.

We will not speak in detail of the combinations which M. Lassaigne has described in his memoir. We shall confine ourselves to noticing their principal properties. These combinations are amorphous; they contain, at the time of their precipitation, always a very considerable quantity of water, and which ordinarily constitutes about three-fourths of their weight. Those of copper and silver are transparent and coloured, the first green, the second yellow. They are all endowed with the property of being soluble in a great number of salts and other matters, among which we may mention sea-salt, sal ammoniac, nitrate of potassa, iodide of potassium, lime-water and ammonia. They present a singular property, remarked long ago in analogous combinations, and latterly by M. Mitscherlich in albuminous sulphate of copper, viz., that the re-agents which are sometimes used to detect the presence of salts, sometimes to ascertain the proportions of it accurately, no longer cause, in these combinations, the ordinary phenomena of precipitation, or coloration characteristic of these salts. Thus, oxide of copper is precipitated neither by potassa nor by sulphuretted hydrogen, nitrate of silver and nitrate of lead combined with albumen are soluble, when cold, the first in a solution of chloride of sodium, the second in a solution of sulphate of soda. These circumstances, and many others of the same nature, have been noticed with peculiar care by M. Lassaigne, who has felt all their importance.

His experiments on animal tissues have shown him that these matters have the property of combining, like albumen, with metallic salts, without decomposing them, and of forming compounds insoluble in water, which many solutions may destroy by redissolving the greater part of the metallic salt which was combined with the organic substance. He has operated particularly on salts of copper and lead, and on portions of the membranous tissue of the small intestines, and pieces of skin freed from hair and cartilage.

M. Lassaigne thinks that in the internal administration of metallic salts, there are established in the animal economy, in consequence of absorption, combinations similar to those of which we have been speaking, between the metallic salts and the albumen contained in the different animal fluids, and it is very probable that their medicinal effect is most often thus produced. Again, he thinks it likely, that in the action of a metallic salt on any animal tissue whatever, there is established at first a combination between these two bodies which, setting out with modifying the vital properties of those organic parts, brings about a change in their functions.

He adds, in conclusion, that it would be interesting to examine the therapeutical effects of compounds of albumen and metallic salts.

In generalizing, as he has done, the action of metallic saline solutions on albumen and the tissues of our organs, in calling, more than has hitherto been done, the attention of chemists to the modifications which the intervention of an animal matter might cause in the characteristic properties of salt, M. Lassaigne has executed, in our opinion, a useful work.

The Academy, which honoured, in 1837, with an insertion in the "*Recueil des Savants Etrangers*," a former work of this chemist on the same subject, will see, doubtless, with interest, the perseverance of which he has given a proof.

We have the honour of proposing that M. Lassaigne's memoir be printed in the "*Recueil des Savants Etrangers.*"

The conclusions of this report were adopted.

ON BUTTER MELTED, AND ON THE MOULDINESS OF BUTTER.*

BY M. TURPIN.

M. Turpin read before the Academy of Sciences, at its sitting of the 9th of December, 1839, a paper entitled, "On the singular physical and microscopical character which butter melted and cooled suddenly takes, and on the great difficulty with which butter in any state becomes musty or produces mould."

The results of his investigations lead him to the following conclusions:—

1. Natural butter contains a great number of milky globules, which, by becoming decomposed and putrid, occasion the speedy rancid state of butter. Left for some time, it forms throughout its extent a great quantity of pointed crystals, grouped in radiating spheroids.

2. Butter melted and cooled presents scarcely anything more than a great agglomeration of crystallized spheroids, each sticking in as many little portions of fatty matter, and become polyhedrous by the mutual pressure.

3. In these two states, the milky globules, or their sub-globules, which are enveloped with butyrous oil, cannot vegetate into mould unless they at length become stripped of the oil which surrounds them.

4. The best filtered milk always holding in suspension a pretty great number of milky sub-globules, which give to the serum its white opal-coloured appearance, may at length produce more or less mould of milk, according to the quantity of globules.

5. If whey, clarified and filtered, appears by its great limpidness free from globules; if the microscope discovers none, it is because, like those of filtered white of eggs, they are too attenuated and too transparent to be perceived. But if this whey be left for two or three days under an ordinary temperature, the globules increase throughout the whole extent of the liquid. It loses its beautiful transparency, its light colour becomes a yellowish green. It becomes turbid, and loses its milky opal colour. The globules partly rise and come to the surface, where they collect into a mycodermic pellicle of a milk white. These globules, seen under the microscope, appear of a fawn colour, and are endued with a very marked motion.

6. Pieces of butter in the natural state and melted, filled with milky globules, have been exposed for 82 days to the influences most favourable to the vegetation of mould, without their surface presenting any trace of mustiness.

ON THE MEANS OF DISTINGUISHING VEGETABLE ALKALIES BY CHLORINE, AND BY THE SULPHO-CYANIDE OF POTASSIUM.†

BY M. LEPAGE.

Last year, M. Pelletier published the fact, that the smallest quantities of strychnine in solution might easily be detected by passing a current of chlorine into it, which causes more or less turbidness, according to the quantity of alkaloid contained in the solution ; but I do not know whether that learned chemist has submitted other alkaloids to the action of the same agent,* with the view of ascertaining whether this property of strychnine, of being precipitated by chlorine, were peculiar to it, and might serve, in case of need, as a distinctive character of this alkaloid. With this view, I have tried some experiments on the most commonly employed alkaloids. This work has appeared to me so much the more useful, as bromine and iodine, some years ago used by Dr. Donné with the same object, offered some very curious results, and especially an excellent distinctive character for brucine, by the exclusive property which its alcoholic solution possesses of becoming violet by the addition of a drop of bromine.

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* *Journal de Chimie Médicale*, February, 1840.

† *Journal de Pharmacie*, March 1840.

I have employed for each experiment 10 centigrammes of alkaloid distilled in 40 grammes of distilled water, assisted by two or three drops of sulphuric or hydrochloric acid, added with a glass rod. The solution effected, I submitted it to the action of a current of chlorine gas for ten minutes ; after having repeated this experiment four times on each alkaloid, the following were the results which I constantly obtained :—

WITH STRYCHNINE.

No alteration when it is quite free from brucine ; the liquor begins to become milky at the end of about five minutes ; this is increased by the continued action of the metalloid for a minute, and the liquid left quiet, allows a precipitate to be deposited.

WITH PURE BRUCINE.

A rather deep red coloration, which appears by the action of the first bubbles of chlorine, but which soon disappears by the ulterior action of this gas : not turbid.

WITH MORPHINE, NARCOTINE, AND EMETINE.

A permanent saffron yellow colour, and a trifling deposit after a long time with emetine only, without any change in the colour of the liquid.

WITH QUININE,† CINCHONINE, AND VERATRINE.

No particular colouring, nor any turbidness.

All the alkaloids used in these experiments were in a state of the greatest purity, except the emetine, which did not appear to be as pure as I could have wished, and which might have some influence on the coloration and precipitate which occurred. The brucine was perfectly crystallized, and had been extracted from the false angustura, which removes all suspicion of the presence of strychnine, as the false angustura does not contain that alkali.

If this action of gaseous chlorine on the precipitated vegetable alkalies, in the state of saline solution, does not offer a distinctive character for each of them, it offers an excellent one for distinguishing strychnine from all the others ; and what is no less important, it gives means, simple enough for every one to use, of recognizing, in an instant, the least traces of strychnine in the brucine of commerce, which is extracted from nux vomica. This brucine, as I have ascertained by operating on several samples from different sources, always contains strychnine, and sometimes in very considerable quantity, which is not without danger in medical use, since it has been proved by MM. Magendie and Andral that the action of strychnine on the animal economy was to that of brucine as 1 to 12. Thus, in a case where we have a suspected brucine, it would be sufficient, to test it, to dissolve 20 or 25 centigrammes of it in 45 grammes of distilled water, assisted by two or three drops of hydrochloric acid, and to pass a current of chlorine gas for about ten minutes in this solution, which, if it contain strychnine, will become milky in about five minutes, and will yield, if left to rest, a precipitate which, washed with pure water, in which it is insoluble, as well as in ether, will be very soluble in alcohol, and will dissolve in powerfully acidulated water, but with difficulty. This last character distinguishes it essentially from normal strychnine.

This method is so delicate, that it allows the detection of three milligrammes of strychnine, as I have ascertained.

Notus (*Journal de Pharmacie*, December 1836) recommends sulpho-cyanide of potassium as a test for strychnine; it yields, he says, a salt in fine crystals, but it is affirmed that quinine is acted on in the same manner.

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* M. Pelletier, in an interesting article published in the *Journal de Pharmacie*, vol. 24, considering the action of chlorine on different alkaloids, and especially on strychnine, has pointed out many of the facts mentioned by M. Lepage : they will serve, therefore, to confirm his accuracy.

† It results, however, from the experiments of MM. André, Pelletier, Brandes, &c., (see the *Chemist*, No. 4, p. 109,) on the action of chlorine on quinine, that this organic base is more or less altered, and that there then occur either brownish red colourings, or precipitates of a resinous aspect, also brownish.

I have likewise tried a series of experiments, all of which I have repeated a great number of times, with the view of ascertaining, if in the above mentioned compound might be found a faithful test, and free from all objection, for some of the vegetable alkalies. Although Notus has not informed us in what vehicle he dissolved the strychnine which he used to discover this reaction, every thing tends to make us believe that it was in acidulated water, for alcohol has the property of dissolving the compound which is formed.

I therefore, as in the preceding experiments, employed each time 10 centigrammes of the alkaloids, dissolved in 40 grammes of distilled water with one or two drops of hydrochloric or sulphuric acid, and I always obtained by adding, to a slight excess, a solution of sulpho-cyanide of potassium at 24 :—*

WITH STRYCHNINE.

By the simple mixture of the liquors, a beautiful crystallization presents itself at the end of two or three hours in the form of needles.

But if, instead of simply mixing the two liquors, it is briskly stirred with a glass rod, the formation of the compound takes place in a few minutes; the crystals, in this case, are less characteristic.

WITH BRUCINE.

At the end of from 12 to 36 hours, a somewhat sandy deposit of white crystals;

But, by stirring the liquid, the compound occurs in about ten minutes; it is then often pulverulent.

WITH CINCHONINE.

Frequently nothing by the simple contact of the two liquids, but by stirring, always a precipitate which is presented under the form of small bracteæ very much resembling acetate of mercury.

WITH QUININE.

After from 12 to 36 hours, a greenish yellow compound is presented under the form of a mass formed by the reunion of very small needles, not offering any resistance.

By stirring the liquid, this compound is formed much sooner; it is then pulverulent, but always possesses the same colour.

WITH VERATRINE AND EMETINE.

Pulverulent precipitates, which are formed immediately, and which are insoluble in an excess of alkaloid.

WITH MORPHINE AND NARCOTINE.

Never anything, either by simple mixture or stirring.

All these compounds, which I have considered as combinations of sulphocyanide of potassium and salts of the vegetable alkalies, from some experiments which I have made for the purpose of convincing myself of it, possess the following properties: they are soluble in water (after, however, the supernatant liquor has been decanted, which always contains a little sulphocyanide of potassium which has been added in excess; for I have remarked that they were insoluble under the influence of this reagent, or that they required for their solution an enormous quantity of water). These compounds are likewise very soluble in alcohol, insoluble in ether, with the exception of those formed in the alkaline salts soluble in that liquid, all soluble in concentrated nitric acid, to which they communicate, except that formed by the brucic salts, a clear wine colour, which disappears entirely in ten or twelve minutes. The brucic compound, on the contrary, communicates to the acid a fine blood-red colour, which stands, and is turned to violet by the addition of one or two drops of protochloride of tin (a distinctive character of brucine).

The colour of the compound formed in the solutions of quinine joined to the property possessed by its solution of becoming green by the addition of chlorine in solution and ammonia, prevents their being confused with any other.

The resemblance of the compound obtained in the salts of cinchonine to the protacetate of mercury, presents likewise a very distinctive character of this alkaloid.

The precipitates formed in the salts of emetine and veratrine have no value as distinctive characters.

The crystalline form of the compound obtained in the solutions of strychnine by the simple mixture of the reagent offers a good distinctive character of that alkali; but it possesses one more valuable still, and to which I call the attention of physicians and apothecaries who may be called forward in medico-legal cases where strychnine has been used in the commission of crime. It is the exclusive property possessed by its aqueous solution, of being decomposed by chlorine gas, and of causing a white precipitate, insoluble in water and ether, ver soluble in alcohol, and very sparingly so even in strongly acidulated water. This precipitate dried on a watch-glass does not give any particular colour when treated with nitric, sulphuric, and hydrochloric acids.

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* The crystallization of the compounds in question is not always sufficiently decided to allow us to judge in all circumstances concerning the nature of such and such a crystalline precipitate; for though that furnished by strychnine is constantly more clear than the others, analogous crystallizations may be obtained with codeïne, quinine, cinchonine, and brucine.

It is needless to mention that in this action of chlorine gas on the solution of this compound, sulphocyanogen never precipitates, the solution being much too weak for that to occur; but the liquor nevertheless loses the characteristics of the sulphocyanide, for it does not redden with the salts of iron after the action of the gas.

I wished to ascertain if, profiting by this property of sulphocyanide of potassa to form an insoluble compound in even the weakest solutions of strychnine (I have proved that one or two centigrammes may be detected in twenty grammes of liquid), and by that also which chlorine possesses of decomposing its aqueous solution, these means might be used with confidence in medico-legal investigations. Having made three experiments on this subject, I have arrived at such satisfactory results that I do not hesitate, for a moment, to propose this means as the most accurate in these kinds of researches.

I poisoned two cats, one with three grains of strychnine, the other with two grains only; the first was opened at the end of twenty-four, and the second at the end of twelve hours; the third experiment consisted in detecting three grains of strychnine which had been kept for six days in a matrass with two pieces of flesh and a certain quantity of weak broth, at a temperature of 18°.

The following is the process which I have followed, and which I propose should be followed in these investigations: after having removed the esophagus and stomach of the poisoned animals, these organs, being cut in pieces, were boiled in a sufficient quantity of distilled water, to which were added five or six drops of hydrochloric acid, so as to cause the water to redden turnsole paper. After ten minutes boiling, the liquor was filtered, and a certain quantity of subacetate of lead (tribasic acetate of lead) added, for the purpose of precipitating the colouring and albuminous matter; after having filtered the liquor again, a current of hydrosulphuric acid gas was passed into it, in order to precipitate, in the state of sulphuret, the excess of subacetate of lead; all that being decomposed, the sulphuret of lead was allowed to deposit, and was separated by filtration; the filter was washed with distilled water and the liquor evaporated to about 40 or 45 grammes in a sand-bath in a porcelain capsule; it was left to cool, and a few drops of a solution of sulphocyanide of potassium were poured into it; there was almost immediately obtained, by stirring with a glass rod, a precipitate of small white needles; it was allowed to deposit completely; this supernatant liquor was removed, and it was washed only once, with a small quantity of distilled water, then sufficient was added to dissolve it. By passing a current of chlorine gas into this solution in a few minutes the water became turbid, and afterwards, by allowing it to stand, a precipitate, possessed of the before-mentioned properties, was formed.

In a case in which, after the precipitation of the lead by sulphuretted hydrogen, the liquor is still colored, it may easily be decolored by boiling with a little animal charcoal which has been well washed in hydrochloric acid.

By passing a current of chlorine gas into the product of the evaporation of the liquor from which the sulphuret of lead has been separated, strychnine is, it is true, precipitated; but this *modus operandi* does not admit, in my opinion, of as much accuracy as that which I propose; for it might happen that, without containing strychnine, the liquor might nevertheless furnish a precipitate by chlorine, if it contains gelatine, for example. If it happen, by chance, as it has done with me once, that the product of the evaporation of the liquor, separated from the sulphuret of lead, acquires a red colour from the sulphocyanide, (and it is always as well to try on a small quantity of the liquor before pouring the reagent into the whole), which coloration would be owing to the presence of iron, two means may be made use of to free it from it. The first, which I have found very successful, consists in boiling the liquid with two or three drops of nitric acid, in order to convert the iron into a peroxide in case it is not so already, and in pouring into the liquor, when cooled, a perfectly neutral solution of succinate of ammonia, to precipitate the iron, in the state of a succinate, and filtering; the ammoniacal salt which remains in the liquor has no influence, either in impeding or favouring the action of the sulphocyanide or the salt of strychnine.

The second means consists in adding to the liquor a little calcined magnesia, drying the product in the sand-bath, and treating it, when hot, by alcohol at 40, which dissolves only the strychnine. The latter may easily be obtained by evaporation; it is then dissolved in distilled water aided by one or two drops of acid, the sulphocyanide is poured into the solution, and the operation is concluded as above mentioned.*

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* The process which M. Lepage here points out for detecting the presence of strychnine, in *chemico-legal* investigations,

although very ingenious, appears to us to give rise to some reflections.

When we are required to decide and to pass judgment on which may depend the honour and life of an accused person, there are required, in our opinion, palpable proofs to get a conviction. Now, it is not after only a few reactions or a few changes of colour that we can decide upon the existence of organic principles especially, as they are so easily modified and transmuted by chemical agents. We should, before all, seek to isolate the poisonous substance, in order to examine it in all respects, and to submit it to all the reactions which characterize it. Many means have been proposed with this view, which need not be repeated; the following has been found successful. It rests upon the facility with which tannin can detect and isolate slight traces of vegetable alkaloids, by causing sparingly soluble and very bulky whitish precipitates. This is a brief detail of the process to be followed:—

The suspected matters, or the organs wherein *unabsorbed* poison is supposed to remain, are taken; then, after having divided them, they are treated twice over by very faintly acidulated boiling alcohol; it is filtered, distilled in the sand bath as far as possible, and water is added to the residue. When the liquor is almost completely neutralized by a few drops of pure ammonia, and cooled, it is filtered in order to separate any fatty or other matters; there is then poured into this liquor a very concentrated solution of pure tannin, until the precipitate ceases to fall. This precipitate, collected on a fine cloth, is washed with a little cold water, then separated and triturated with an excess of slaked lime reduced to a fine powder; the mixture dried at 100° centig. is pulverised and boiled in rectified alcohol. This alcoholic vehicle filtered leaves, after a well-directed evaporation, the alkaloid sought for, which must be combined carefully with an acid, in order that it may be obtained in a crystallized saline form; it is in this state only that the alkaloid can easily be separated from it, and afterwards submitted to all the tests of reagents, among which the means presented by M. Lepage will find a place.

In very complex mixtures there have been found very small quantities of alkaloids added, directly or indirectly, in matters which contained them.

II. CHEMICAL MANUFACTURES.

REPORT CONCERNING A MEMOIR BY M. BOUTIN, ON THE PRODUCTS RESULTING FROM THE ACTION OF NITRIC ACID ON THE RESIN OF ALOES, AND THEIR APPLICATION TO DYEING.*

BY MM. THENARD, ROBIQUET, AND PELOUZE.

The resin of aloes, submitted to the action of nitric acid, gives rise to several products, among which a remarkable acid is found, whose chemical examination and applications in the art of dyeing constitute principally the memoir of which the Academy has commissioned us to render an account. This acid was first noticed in 1808, by M. Braconnot, and was called, by him, aloetic acid. He obtained it in a yellow, uncrystallizable, and extremely bitter powder, rather soluble in water, to which it communicates a fine arterial blood-red colour, and forming with potassa a deep red salt, which is capable of detonating with the violence of gunpowder, disengaging a decided smell of prussic acid, and leaving after combustion a slight carbonaceous trace.

M. Braconnot also discovered oxalic acid among the products of the action of nitric acid on aloes.

Some time afterwards, M. Liebig devoted his attention to the same subject, and asserted, that besides the two above-mentioned acids, aloes contained a third, carbazotic acid, when submitted to the prolonged action of a great quantity of concentrated nitric acid. He described some of the principal properties of aloetic acid, and remarked, that silk boiled in an aqueous solution of it acquired a beautiful purple red colour, which resisted the action of alkalies and acids; that wool was dyed black, and cotton pink. However, M. Liebig did not push his investigations on this subject any farther.

The history of aloetic acid presents, therefore, many deficiencies, which M. Boutin has endeavoured to fill up; and if, in quitting, for manufacture, the Museum where he was preparer, he regretted being unable to complete, as he could have wished, the scientific part of his memoir, in requital he has found himself in a position, in his dye-house, to make applications to the arts, which would, perhaps, have escaped him in his laboratory.

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* *Academy of Sciences*, sitting of March 16th, 1840.

M. Boutin obtains aloetic acid by a process similar to that pointed out by M. Braconnot: he considers the yellow colour attributed to it as a sign of impurity, and recommends, in order to free it from matters which soil it, that it be washed with warm water until it acquires a fine purple red colour. After which, there only remains to unite it with potassa or soda, to crystallize the salt several times, and to decompose it with hydrochloric acid, which, to be perfectly pure, requires only washing with warm water.

Aloetic acid, which M. Boutin designates polychromatic acid, does not present crystalline forms, from whatever solvent it may have been separated. It is a powder of a deep red-brown, very bitter and astringent, without any perceptible smell, requiring for its solution nearly 900 times its weight of cold water, and only 70 or 80 parts of alcohol.

A temperature of 300° or 400° centig. decomposes aloetic acid instantly, which fuses and detonates gently. On red-hot charcoal it disengages a purple vapour, and gases of a cyanic smell. All its salts are coloured, and most frequently insoluble. Some of them, and particularly the aloetate of silver, fulminate when heated. Those which are insoluble, or but little soluble, may easily be prepared with aloetate of potassa, by double decomposition.

M. Liebig had asserted that aloetate of potassa is decomposed by alcohol, which separates from it nitre and a yellow bitter matter. This circumstance is owing, in M. Boutin's opinion, to the impurity of the salt on which M. Liebig operated; for he had not reproduced it with the aloetate of potassa as above mentioned. This salt remains unalterable in alcohol. M. Boutin's observation appears so much the more correct, as M. Liebig has not said any thing to lead us to believe that he had obtained pure aloetic acid.

With respect to the purity of this substance, as prepared by M. Boutin, we may add, that there is nothing to prove that it is complete, since he has not given us any information concerning its elementary combination, and that of its salts. However, as aloetic acid and the aloetates always present the same physical properties, as besides it forms with potassa a well crystallized salt, in which there is never perceived a single homogeneous matter, we consider it very probable that the aloetic acid prepared by the process of M. Boutin is very pure.

The elementary analysis of a fine sample of this acid presents the following numbers:—

Carbon .... = 40·0
Hydrogen .... = 1·1
Azote .... = 12·2
Oxygen .... = 46·7

which, in equivalents, leads to the formula

$$C^{15}\,Az_2\,H^2\,O^{13}.$$

This analysis, to be considered exactly correct, requires to be repeated and compared with that of some aloetates. It is sufficient, however, to distinguish it from indigotic and carbazotic acids, which, especially the latter, much resemble it. This analysis is also sufficient to prevent aloetic acid being confounded with the substance which M. Gerhardt has lately discovered as the product of the action of nitric acid on hellenine, and which he has called nitro-hellenine.

M. Wöhler, by deoxidising carbazotic acid by a process similar to that by which blue indigo is transformed into white indigo, has obtained a new acid, which he calls nitro-hematic. This skilful chemist has not given its elementary composition. The properties of nitro-hematic acid differ so little from those of aloetic acid, that we should not be surprised if these bodies were identical, and the dissimilarity in some cases is so feeble, that it might be owing to the impure condition of the nitro-hematic acid. The same may be said of the yellow bitter substance discovered by M. Braconnot among the products of the action of nitric acid on the resins of gamboge and myrrh. It seems to us likewise to be possible that aloetic acid might result from the treatment of indigo by nitric acid, after the formation of indigotic acid, and before that of carbazotic; for on one part the aloetic acid is changed, as we have said, into carbazotic acid, giving rise simultaneously to a peculiar matter, cyanyle, which is likewise found, according to M. Boutin, in the products resulting from the decomposition of indigo by nitric acid, and on another part setting out from the composition assigned by M. Dumas to indigotic acid, and the analysis of aloetic acid, the latter might be formed in a very simple manner. Nitric acid would remove from indigotic acid 3 equivalents of hydrogen, and would replace them in aloetic acid by 1 equivalent of nitrous acid, $Az\,O^3$.

Whatever may be the preceding considerations, which we present with reserve and as simple hypotheses, it is very certain that there are many beautiful experiments to be tried, and an ample harvest of observations to be gathered, in the comparative examination of the products of which we have spoken, and in the precise definition of the circumstances under which they are formed.

The notions which we possess concerning the different matters which result from the action of nitric acid on organic substances, may be reduced to a small compass; if it be true to say that we have studied some of these products with much care, it is not less true that we may add that their formation is not foreseen by any rule, and that it is scarcely possible to represent by a chemical equation some particular cases of these kinds of reaction. The difficulty seems to be increased when the azote of nitric acid intervenes as a principal constituent of the new matters to which this acid gives rise.

We have said that M. Boutin has noticed the formation of a liquid matter which appears at the same time as the carbazotic acid. This matter, which he has called cyanyle, has scarcely been examined by the author, who has confined himself to the description of some of its physical properties.

Cyanyle is a colourless liquid, of an excessively strong and penetrating odour, which completely resembles that of prussic acid and cyanogen, insoluble in water, more dense than that liquid, and poisonous even in a very small dose. It is volatile, and enters into ebullition without being decomposed at a temperature which seems very high.

M. Boutin has made the interesting observation that wool, and particularly silk, are dyed with facility by aloetic acid, which is capable of communicating to them the most varied shades. According to him, these shades are more solid than those obtained by the colouring matters of organic nature generally employed; and as besides aloetic acid is easily prepared, and as its tinctorial power is very considerable, he thinks that the art of dyeing will derive great advantage from the employment of this acid. Time will decide if the expectations of M. Boutin are well founded; at all events, the results at which he has arrived are curious, and cannot fail to attract the attention of dyers.

We may here give, in a succinct manner, the principal experiments which M. Boutin has published, and which we have witnessed.

By dipping silk into a solution of acetate of copper, as a mordant, at a temperature of 70° or 80° centig., washing it afterwards in an ammoniacal water, and passing it into a bath of aloetic acid, of the same temperature as the mordant, and finishing by washing with weak vinegar, more or less deep wood colours were obtained.

Corinth shades are fixed by immersing the silk in a dilute solution of tartaric or citric acid, at 40° centig., and afterwards passing it into a more or less strong bath of aloetic acid at a temperature of 50° to 60 centig.

The rose shade is obtained in the same way, except that the bath ought to be weaker, and should contain a little alum.

The violet shades deserve especial attention, for we know how rare are the organic matters which yield them. M. Boutin obtains them by adding to the bath of aloetic acid, liquid ammonia and acetic acid. The silk should not be dyed in it until it is well turned to violet, and at the temperature of 50° or 60° centig. For silk, the bath should contain an excess of acid; with wool, on the contrary, ammonia should predominate.

The blue colour is prepared by adding to the bath of aloetic acid a double salt prepared with protochloride of tin and cream of tartar. The bath first turns to violet. There is afterwards added to it a solution of chloride of tin and tartaric acid; a small quantity of liquid ammonia is afterwards sufficient to turn the bath blue. It is then that the silk is dipped into it, and is immediately dyed of a solid blue, as M. Boutin has shown.

Blanched, fancy, and avanturine shades, and some others, may be fixed in silk and wool, by processes more or less analogous.

Green is obtained by passing the silk dyed yellow by carbazotic acid into the blue bath before described.

In conclusion, M. Boutin's memoir contains observations of high importance both to science and the arts.

We have the honour of proposing to the Academy, that it give its approbation to this work, and thank the author for his communication.

The conclusions of this report were adopted.

ON DRINKABLE AND NATURAL WATERS: AND ON THE INFLUENCE OF THEIR PURITY IN DYEING.*

BY M. DUPASQUIER.

M. Dupasquier, Professor of Chemistry at Lyons, submitted to the Academy of Sciences at its sitting of the 13th of January, a paper on drinkable waters, the principal results of which are as follows; it will be perceived that many of them are opposed to generally received opinions:—

1st. The wholesomeness of drinkable waters is not directly referable to their purity; the purest are far from being the most wholesome; 2d, hitherto calcareous salts have been reckoned among the most deleterious substances in drinkable waters: this opinion is erroneous at any rate as respects carbonate of lime, which, dissolved in the state of bicarbonate, exerts a beneficial action when its waters are employed as a drink; 3d, constancy of temperature is, at least, as important to be considered in drinkable waters as their chemical composition; 4th, it is generally believed that all the calcareous salts decompose soap, and render waters hard and impregnated with selenite: this opinion is true only as regards those which are directly soluble in water, as sulphate of lime, chloride of calcium, and nitrate of lime; 5th, carbonate of lime, dissolved in drinkable waters with the assistance of an excess of carbonic acid, does not decompose soap, nor does it cause, like other salts of lime, the formation of clots of calcareous soap, even when in great quantity; 6th, Notwithstanding the solution in water of a quantity of carbonate of lime six times more considerable than that of the waters which contain most of it, it still dissolves soap without causing clots; only it assumes a rather milky tint; 7th, carbonate of lime effects the decomposition of soap, only when in so great quantity as in certain mineral waters, as those, among others, of Saint Allyre, in Auvergne, which hold in solution eight or nine times more of this salt than ordinary spring waters; 8th, in the same manner as the purest waters are not the most wholesome, so are they not the best adapted to certain manufacturing operations; 9th, it is an error, for example, to believe that those waters which are least charged with calcareous salts, and which are very fit for scouring silk, are best for the operations of dyeing; numerous experiments have proved, and the result of the practice of the dyers of Lyons proves, that spring waters containing calcareous salts are the only ones proper to give, with all the splendour and solidity of which they are susceptible, the numerous shades of white on silk; that waters from calcareous springs develope the intensity of almost all colouring principles, and can, by giving more beautiful colours, cause in the quantity of tinctorial substances a saving estimated by dyers at one fifth; 10th, lastly, the remarkable effect attributed to the generality of calcareous salts by the dyers of Lyons, is produced only by one of those compounds which exist naturally in solution in spring and river water. Indeed, comparative experiments made with every salt of drinking waters, tried separately, have shown that sulphate of lime, chloride of calcium, and sulphate of magnesia, are nearly without action on the colouring principle of tinctorial matters; the favourable influence exerted on this principle by waters used to dissolve it is entirely owing to carbonate of lime, which explains why the spring waters on the left bank of the Saône, near Lyons, which are very considerably charged with this principle, are so much superior, for dyeing purposes, principally for shaded whites and light colours, to the waters of the Rhone, which hold in solution as much of other salts as these spring waters, but which give by analysis only half as much carbonate of lime.

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* *Journal de Chimie Médicale*, Mar. 1840.

EXTRACT OF A REPORT ON M. SEGUIN'S MEMOIR; ENTITLED, INVESTIGATIONS CONCERNING THE DISTILLATION OF ANIMAL MATTERS.*

BY MM. ARAGO, BECQUEREL, DUMAS, ETC.

M. Seguin has proposed to collect the gaseous products resulting from the distillation of animal matters; to purify them in a suitable manner; and to render them fit for lighting towns, thus increasing the number of the useful products of the operation.

The muscles of animals, lying, abandoned as useless, in the kennel, have especially attracted M. Seguin's attention. These animal matters, containing at least 60 per cent of water, could not be stored without great inconvenience, and their products besides being very irregular, M. Seguin thought of drying them at a very moderate expense. He effected this in the most satisfactory manner, both as regards economy and salubrity: indeed, the drying is operated by the heat lost from the distilling apparatus, and the wash, being raised above the animal matter, and carried away by a well directed draught, is obliged to traverse the furnace where it is completely disinfected.

After having thus economically dried the matters which he employed without impairing the salubrity of the air, M. Seguin had to study and regulate the distillation of the animal matters; he has determined, by numerous experiments, the most convenient arrangement of the retort, and the most advantageous temperature to be employed in order to produce gas of the best quality. With the disposition of the apparatus adopted by M. Seguin, the retorts should be heated rather above a cherry red.

The products obtained by the distillation of animal matters are, as we are aware, more numerous and complicated than those which have ordinarily to be treated in gas-works. The solid products, which are bone-black, and the charcoal of the muscles, may be sold in commerce; but this is not the case with the liquid ones, gases and vapours, collected during the operation: these latter are carburets of hydrogen, some liquid, others gaseous; being accompanied by sulphuret of carbon, carbonate, acetate and hydrosulphate of ammonia, these various products require the application of accurate chemical knowledge, in order to be properly purified and appropriated to the purposes for which they are intended.

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* Academy of Sciences, sitting of the 16th of March; from *Comptes Rendus*, No. 11.

M. Seguin passes them through a solution of hydrochlorate of lime, which retains all the carbonate of ammonia. The carbonic acid combines with the lime, and the hydrochloric acid with the ammonia. The separation of the sulphuret of carbon, which, in burning, would have produced carbonic and sulphurous acids, and which it was consequently very important to separate from the gas to render it fit for lighting, was a delicate operation: M. Seguin found no guide in the purifying processes commonly used in manufacture, and it is to his chemical knowledge that is owing the surmounting of this difficulty, which was of a nature to render useless the perfection to which he had brought the other parts of his process. He seems to have attained his object by passing the gas when cold slowly from the first purifyer, into a tube filled with pieces of sulphur, and sending it into the gasometer only when it gives no more sulphurous acid by burning: here the sulphur, which, being dissolved in the sulphuret of carbon, retains it without decomposing it, destroys its tension, and thus effects the purification of the gas completely. We think that this ingenious process ought to be considered by oil-gas manufacturers, to whom the presence of sulphuret of carbon is sometimes a very serious inconvenience.

The gas, after being thus purified, does not contain, according to M. Seguin, more than about 10 gr. of empyreumatic vapour in the cubic metre, and it is possessed of so great an illuminating power, that only 22 litres are required to give, for the space of an hour, as much light as Carcel's lamp.

M. Seguin says, that in submitting to distillation a horse of the mean weight of 255, *kilog.*, 75, he obtains:—

22,309 litres of gas capable of maintaining a large lamp for 359 hours;
11 *kilog.*, 35 sal ammoniac;
And 15 *kilog.* 75 bone-black.

We find in documents, which we possess concerning the manufacture of sulphate of ammonia, a proof that there might be obtained, in a continued work, a greater proportion of sal ammoniac, and particularly bone-black: we are, therefore, far from considering the quantity of the products obtained by M. Seguin as exaggerated, and we even think that *in this respect* the account of the manufacture which he has given at the end of his memoir might be ameliorated.

We have seen M. Seguin operate; we have examined the apparatus and mode of distillation which he has established; we have spent an evening in a room lighted with gas prepared by his process; we have observed with interest the perfection to which M. Seguin has brought the construction of the pump, which, under certain circumstances, he uses to compress the gas, and the apparatus which he employs for regulating the efflux of the compressed gas; and we have ascertained that the gas resulting from the distillation of animal matters, as prepared by M. Seguin, burns without smell, and gives a brilliant white light of great illuminating power. We are delighted to acknowledge that M. Seguin has given a proof of talent and perseverance in organizing, as he has done, the distillation, on a large scale, of animal matters, with the view, chiefly, of producing a lighting gas of good quality. We shall not enter into the question of how far those manufactures in which the remains of animal matters, formerly valueless, are used, will be injured by the execution of M. Seguin's projects, by the increase in demand, and consequently in price, which will arise. Still less shall we say anything concerning the financial part of the memoir, because that would be contrary to the customs of the Academy, besides it would require us to devote ourselves to a long series of verifications which could not be done by means of an experimental apparatus; but we own that we have taken cognizance of M. Seguin's labours with great interest, and we propose that the Academy approve of his researches, and engage him to continue and complete the chemical study of the various products obtained by distilling animal matters in the large way.

The conclusions of this report were adopted.

PROPORTIONS OF SUGAR IN THE CANE.*

BY M. PELIGOT.

M. Thenard, in the name of a commission, read to the Academy of Sciences, at its sitting of the 27th of January, a report on a work by M. Peligot. M. Thenard's report touches upon a question too important for us to omit giving an abstract of it.

The authors who analysed the *vesou*, or juice of the cane, regarded it as water holding in solution sugar, gum, albumen, mucilage, a kind of saponaceous liquid, acids, and various salts; they considered it also as a liquid of a very complicated nature; whence, in their opinion, the causes which rendered its extraction so difficult.

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* *Journal de Chimie Médicale*, Mar. 1840.

M. Peligot has shown, on the contrary, that the filtered juice of the sugar cane is formed simply of four parts of water and one of crystallizable sugar; that it is only dissolved sugar, or at any rate, that the organic or saline substances found in it are equal to only from 1 to 7 in 1000 of its weight.

Investigating afterwards how much juice the cane contained, he found, like M. Avequin, that it amounted to 90 per cent. Now, as one-fifth of this is sugar, it follows that the cane ought to yield 18 per cent. of sugar.

How does it occur, however, that manufacturers obtain only 6 or 8 per cent. of sugar, and 2 or 3 per cent. of molasses, from the juice, and even that according to M. de Jabrun, delegate from Guadaloupe, the rendering into sugar can be only 5, and into molasses 1·72. It is because the mill extracts only $\frac{5}{9}$ of the juice, according to MM. Peligot and Avequin, and only $\frac{2}{6}$ according to M. Jabrun.

It has now been proved, that in all cases a great quantity of sugar remains in the cane, or is burnt in the "bagasse." Would it not be possible to extract it by putting the cane in contact with almost boiling water?

It is very certain that the processes of evaporation and boiling leave much to be desired, and give rise to much molasses.

M. Peligot has experimented only on one kind of juice; the results which he has obtained will, therefore, doubtless undergo many modifications; be that as it may, his conclusions are as follows:—

The cane contains more sugar than is thought.

A great quantity of sugar remains in the "bagasse."

The juice is merely water containing sugar.

The boiling of the sugar is operated by very imperfect processes.

It is therefore to be hoped that important improvements will be made in the art of extracting sugar from the cane and that much more will be extracted from it than is at present the case.

ON THE PRESENCE OF ARSENIC IN CAST-METAL.*

Some authors had already established the fact that cast-metal contained arsenic; we have obtained proof of it by trials with Marsh's apparatus. (See the *Journal de Chimie Médicale*, vol. xv. p. 385.)

M. Wöhler, who has made trials on castings, has just announced that he has found arsenic in four species, coming from different high furnaces. He says that the reason why that arsenic has escaped analysis in a great number of cases, is, because it has not always been sought where it was necessary to seek for it in order to find it; he says that in the solutions of iron by sulphuric acid, it is not disengaged with the hydrogen, but that it remains mixed with the carbon and the silex.

M. Wöhler says that it may be extracted from that mixture by submitting it to a solution of caustic potassa, or to the sulphate of ammonia; if it is combined with the latter, it is precipitated by an acid, and is obtained under the form of sulphuret of arsenic.

M. Wöhler has announced his intention of soon publishing a memoir on this subject.

NEW MODE OF APPLYING THE MERCURY TO DRAWINGS OBTAINED WITH THE DAGUERRE'OTYPE.†

BY M. SOLEIL.

The application of mercury, such as has been recommended by M. Daguerre, presents, indisputably, every desirable security for producing fine impressions, and I should not have sought to propose another method, had I not been led to do so, in consequence of the demands of several persons who thought they had discovered in the employment of a liquid metal, some inconveniences among which we may mention the following:—

The difficulty of carrying about liquid mercury; the quantity necessary for operating, which generally amounts to about a kilogramme; the danger of breaking the flask containing the metal; the facility with which the thermometer is broken by blows and by heat; the dissemination of imperceptible globules of mercury which penetrate everywhere, attach to the fingers of the operator, upon the table whereon it is polished, &c., and conclude by soiling the plates in such a manner as to occasion the loss of several hours' labour, &c.; finally, the impossibility of remedying, in certain cases, many of these accidents, as, for example, the breaking of the thermometer.

After many experiments, I determined on the following process:—

Take silver, precipitated from the nitrate by copper	1 part,
Distilled mercury	5 parts.

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* *Journal de Chimie Médicale*, Feb. 1840.

† *Comptes Rendus*, No. 9, March 2, 1840.

The amalgam which results from this mixture is confined in a flask stopped with emery.

To use it, a small silver spatula is dipped into it, which draws out sufficient amalgam to rub slightly over a disk of fine silver of about four centimetres in diameter, and of one millimetre in thickness.

This disk, amalgamated for the extent of a fifty centime piece, is placed at the bottom of the mercury-box, which, to receive it, is slightly hollowed in the middle: this bottom is formed of an iron plate.

The impression is disposed of as usual,—and the bottom of the box is very gently heated, in the place which corresponds to the silver disk.

The wick of the lamp should be composed of but three or four threads of cotton, and the flame ought to terminate two or three centimetres from the bottom of the box, in order that a rather elevated heat may always be maintained.

It is thus heated until the image appears: experience has proved to me that the length of time occupied by the operation is not always the same; some impressions require to be subjected several times to the mercury. I will add, in conclusion, that the subjecting the plate to the mercury must not be delayed too long after leaving the camera obscura.

MODIFICATION IN THE PREPARATION OF PLATES FOR RECEIVING PHOTOGRAPHIC IMAGES.*

BY M. SE′GUIER.

M. Séguier presented to the Academy of Sciences two photographic images formed on plates prepared by means of a more simple process than is ordinarily had recourse to.

A single scouring, with tripoli moistened with acidulated water, appears to be sufficient to cleanse the plates thoroughly.

The long operation of polishing with oil is completely done away with, as well as the heating of the plates before and after washing with acidulated water.

This mode of preparing the plates does not occupy more than two minutes.

ON THE GALVANO PLASTIC PROCESSES OF M. JACOBY.†

BY M. DEMIDOFF.

M. Demidoff addressed a summary of his correspondence with M. Jacoby concerning the new art, which the latter calls Galvano-plastic. The letters of M. Jacoby announced the sending of three copies of bas-reliefs obtained by aid of the pile. When these pieces have arrived we shall return in detail to the discovery of M. Jacoby. At present we content ourselves with extracting from the Memoir of M. Demidoff the following passage:—

"Having taken a metallic plate, on which was found a photogenic image produced by the Daguerréotype, our natural philosopher made use of it as a mould in the apparatus, wherein the reduction of metallic copper is operated. The action generated by a voltaic couple having been continued during twenty-four hours, there resulted from it a sheet of galvanic copper of perfect polish, upon which was found a very distinct impression of the photogenic image, only the shades and lights were traced the wrong way."

After this communication, M. Arago exhibited to the Academy two beautiful copper medals obtained at Frankfort, by M. Vogel, by the galvano plastic processes.

M. Becquerel presented some analogous products which had been given to him by M. Boquillon, of the Conservatory.

PREPARATION OF A PAPER FOR RECEIVING PHOTOGENIC IMAGES.‡

BY M. LASSAIGNE.

The photogenic processes which MM. Bayard and Verignon have just published, (see *The Chemist*, No. IV. p. 119), being founded on the principle which I first discovered, and which I put in execution, about a year since, for copying engravings by the action of light, I have the honour of calling to mind, that on the 8th April, 1839, I presented to the Academy a drawing which I had obtained upon *a paper stained, of a violet brown by sub-chloride of silver, and afterwards impregnated with a solution of iodide of potassium.*

My communication to the Academy of Sciences has been printed, not only in the *Comptes Rendus des Séances* 1re sem. 1839, p. 547, but in a detailed paper published in July of the same year, in the *Journal des Connaisances Nécessaires*, by M. Chevallier.

REMARKS OF M. BIOT CONCERNING THE PRECEDING NOTE.

The reclamation of M. Lassaigne is perfectly correct, as to priority of the employment of the iodine, and the formation, by this means of copies of engravings in which lights and shades are reproduced in their proper place. If the publicity given to this process by its inventor had not incontestibly

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[*] *Comptes Rendus*, No. 10, March 9, 1840.

[†] Academy of Sciences, sitting of March 2, 1840.

[‡] *Comptes Rendus*, No. 9, March 2, 1840.

secured his rights, I would with pleasure add my evidence, having been one of the first witnesses of its success. But I think that M. Lassaigne has not presented any impression caused by radiation in the camera obscura, though he has endeavoured to obtain some with apparatus indeed imperfect. MM. Bayard and Verignon having presented such, it must be presumed that they have discovered some circumstance peculiarly efficacious to ensure success. According to what they have announced, this circumstance would consist in the state of humidity of the paper impregnated with iodine, and in the preservation of this state while the radiation is acting.

COPIES OF STATUES, EXECUTED BY M. DUTEIL'S MACHINE.*

M. Arago presented to the Academy of Sciences, at its sitting of the 9th of March, in the name of M. Duteil, two copies of the same statue executed by means of the machine mentioned in the sitting of the 24th of February, one of which copies was in the state in which the machine left it, and the other was finished by the sculptor. M. Arago observed that the sketch given by the machine had been executed in 24 days, requiring only the attention of a young apprentice, while to obtain a similar one, by the ordinary means, would have occupied a practitioner three months.

ON A PHOTOGENIC PAPER FOR COPYING DRAWINGS AND ENGRAVINGS.†

BY M. E. BECQUEREL.

Soon after the discovery of MM. Niépce and Daguerre, several photogenic papers were investigated; to my knowledge but two or three of them give drawings in the natural direction, that is to say, representing shades by shades and lights by lights. M. Bayard has formed one of these papers, and in a recent sitting of the Academy, he has explained the process by which he some time since copied the drawings of the camera obscura. The preparation of this paper requires the use of nitrate of silver.

Some months ago, M. Ponton made known a sensitive paper (see *The Chemist*, No. III., 2nd edition, page 73); it was prepared by steeping a sheet of paper in a solution of bichromate of potassa, drying it and exposing it to the light; the action of the chromic acid on the paper is such that the parts exposed to radiation gradually become orange-coloured; afterwards, if the paper be dipped in water, all the bichromate which had not been exposed to the solar action is dissolved, and there is printed on the paper those parts only which have been exposed to the light. With this paper, M. Ponton has copied engravings with advantage. There is thus obtained a faint representation of objects, shades being represented by lights, and *vice versâ*, as with papers of chloride or bromide of silver. In studying the action of chromic acid on organic matters under the influence of the sun, with which action I am at this time occupied, I have been led to continue M. Ponton's process, and I have been enabled to produce a new paper capable of representing in the drawing produced by the action of the solar radiation, shades by shades, and lights by lights, and of giving, not only another tint to it, but even more vigour. It is sufficient to steep a paper prepared in M. Ponton's manner, and upon which there exists a faint copy of a drawing, in a solution of iodine in alcohol, to wash this paper in water, and then dry it; then the parts which were white become blue, and those which were yellow remain more or less clear.

The following is a detail and an explanation of this process: having employed various kinds of paper impregnated with the bichromate of potassa, I discovered that they were not all apt to produce drawings rapidly; that the mode of sizing influenced their coloration by light, and that with unsized paper coloration was effected after a long time; whence I perceived that the principal reaction resulted from the chromic acid contained in the bichromate on the starch in the size of the paper; then, as starch has the property of forming with iodine a combination of a very fine blue colour, I thought that on those parts of the paper which had not been exposed to the action of the solar rays, the starch not being combined with chromic acid, iodine ought to form the blue iodide, and thus represent shades by shades.

When it is wished, by means of this process, to copy an engraving, the method which I have followed should be adopted: it should first be ascertained that the paper is well sized, and that the starch is spread uniformly over its surface; for that it is steeped in a weak alcoholic solution of iodine, then washed in a great quantity of water; by this second immersion, it should take a fine blue tint, which the first did not give. If this tint is uniform the paper is considered fit for the experiment; in the contrary case it should be again sized. Common paper suits better for this object than any other.

It is afterwards steeped, according to M.

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* *Comptes Rendus*, No. 10, March 9, 1840.

† Academy of Sciences, sitting of the 16th of March, *Comptes Rendus*, No. 11.

Ponton's direction, in a concentrated solution of bichromate of potassa; then, in order that the paper may be stained more uniformly, after a few moments' immersion it is compressed strongly between sheets of blotting paper, and dried either by leaving it in the blotting paper in the dark, or by putting it near the fire. To be effective, it should be very dry. When it is thus impregnated with bichromate of potassa, it is placed on a plate, then covered with the engraving to be copied, taking care that the side of the drawing be applied to the paper, and with a glass plate fitted in a screw press, they are pressed against one another, and thus exposed to the solar rays. At the expiration of a time varying from thirty seconds to fifteen minutes according to the thickness of the paper of the engraving, the drawing is very distinct (in diffused light a longer time is necessary). The engraving is removed, the paper washed and dried. When dry, it is steeped in a weak alcoholic solution of iodine, and afterwards, when it has remained in it some time, it is washed in water and carefully dried in blotting paper, but not at the fire, for at a little before 100° the combination of iodine and starch discolors. If it be considered that the drawing is not sufficiently distinct this immersion may be repeated several times; by this means may be obtained the intensity of tone which is desired to be given to the drawing, which intensity cannot be changed at will by employing a more concentrated solution of iodine.

When the paper is damp, the shades are of a very fine blue, but when it is dry the colour becomes deep violet. I have discovered that when it is still wet, if it be covered with a layer of gum arabic, the colour of the drawing is greatly preserved, and more beautiful when it is dry. When a paper is thus prepared, at first it loses a little of its tone, but it afterwards preserves its violet tint.

By means of this process engravings and drawings may be faithfully copied, and that at a very low price, for the process is very cheap and of easy execution. However, the vigour of the drawing produced is not as great as that of the engraving, but it has not so much dryness. The demi-tints are faithfully copied.

The Academy will be able to judge of the correctness of the facts from the impressions which I have the honour to exhibit to them, and which are only the first productions of a process which has yet to be perfected.

The experiments which I have tried in copying images of the camera obscura by means of this paper, not having yet given satisfactory results, I will not trouble the Academy with them.

ON AN APPARATUS FOR DRAWING MICROSCOPIC OBJECTS, AND BY MEANS OF WHICH THE PHOTOGRAPHICAL REPRESENTATION OF THOSE OBJECTS MAY BE OBTAINED.*

BY M. LEFEBVRE.

An apparatus with which the figure, whether of the natural size, or more or less magnified, of an opaque or transparent body, may be copied on the surface of ground glass or glazed paper, so that an object may be copied in all its details from nature itself, was invented five or six years ago by M. A. Percheron and myself, made by M. C. Chevallier, presented by me to the Entomological Society of France, at its sitting of the 6th of April, 1836, mentioned by M. C. Chevallier in his last pamphlet, made known under the name of Megagraph, and employed with success by several entomologists.

To substitute for the ground glass which receives the image, an iodized plate, was therefore the only operation necessary to obtain the drawing by it.

Before the publicity given to the Daguerréotype, M. Lerebours and myself had obtained results similar to those which M. Donné has since published, and which he says he obtained with an apparatus the idea of which had been suggested by M. Doyere; for which apparatus, as it is founded absolutely on the same principles as that which we made known several years ago, the priority of invention cannot be disputed to us.

As to the applications to photography, if we have delayed presenting the products we have obtained, it is because we have awaited some slight improvements intended to render this operation still more easy and certain; it occupies from three to ten minutes. We have now the honour of exhibiting to the Academy some of the first drawings obtained by means of the Megagraph, in order that they may be compared with those of M. Donné.

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* Academy of Sciences, sitting of the 16th of March; *Comptes Rendus*, No. 11.

III. PHARMACY, &c.

ON STIBIAL TARTAR.†

BY M. ORFILA.

M. Orfila read a very interesting memoir on stibial tartar, and the means of detecting its presence in animal organs.

It results from his experiments:—

1st. That stibial tartar introduced into the stomach or applied to the subcutaneous cellular tissue of living dogs is absorbed and carried into all the organs of the animal economy, as M. Magendie had announced, without demonstration.

2d. That when it is put in fine powder upon the subcutaneous cellular tissue of the internal part of the thigh, two grains were sufficient to cause death in small dogs at the expiration of 30 or 40 hours.

3d. That it is possible by means of certain chemical processes to extract metallic antimony from the portion of stibial tartar which has been absorbed.

4th. That it becomes indispensable to recur to this extraction when the poison has not been found in the digestive canal or upon the other parts to which it had been directly applied, or in the matter vomited; for in seeking stibial tartar in the stomach and intestines merely, so much the more risk is run of not discovering it, as it is very easily vomited, while the metal of one part, at least, may always be obtained from the absorbed portion.

5th. That a medico-legal report should be declared incomplete and insufficient, if, *in the case indicated*, the search for stibial tartar in the tissues, where it may be found after having been absorbed, has been omitted.

6th. That among the viscera of the animal economy, the secretive organs and particularly the liver and kidneys, contain much more of it than the others, which is evidently because the blood stays longer in the former than the latter.

7th. That if it is decomposed by the blood and by the organs, this decomposition is not complete, since, in treating these organs by boiling water, a liquid very sensibly antimonial, is obtained; indeed, it would not be impossible that the tartaric acid alone should be decomposed and the stibial tartar reduced to hypo-antimonite of potassa which is soluble in boiling water.

8th. That this poison may be detected by treating, in a suitable manner, one of the viscera of the animal economy previously dried, especially when this viscus is an organ of secretion; but that it is preferable to operate on several of them at once, in order to procure a greater quantity of metallic antimony and to recognise it more easily.

9th. That it might however happen in a medico-legal investigation, that no trace of this metal might be extracted by analysing the viscera alone or together, because the emetic remains only a certain time in them, and it might have already left them in order to combine with the fluids secreted; but a considerable proportion of antimony may always be obtained by acting in a proper manner on these fluids, and especially on urine.

10th. That if it be true, that arsenious acid acts, in this respect, like emetic, that is to say, that it escapes first from the blood, then from the viscera, to mix with the secreted liquids; this effect does not, however, take place by any means so rapidly as with stibial tartar, and this explains why there is often found in the blood and viscera a portion of the absorbed arsenic. That it might happen, however, if death occurred only at the end of a few days, that the arsenical poison might exist only in the urine and the other secreted liquids, in which the medical investigator would necessarily be obliged to seek them.

11th. That the process to be followed, for the extraction of the metallic antimony contained in the portion of stibial tartar absorbed, consists in carbonising the dried viscera by pure concentrated nitric acid, in a porcelain capsule, as I have directed in my memoir on arsenic, in boiling the carbon obtained, for half an hour, with hydrochloric acid mixed with a few drops of nitric acid, in filtering the liquid and in introducing it into a Marsh's apparatus: there will soon be disengaged antimoniuretted hydrogen gas, which being inflamed will deposit great part of the metal which it contains, upon a porcelain plate. During the carbonisation, the tartaric acid is entirely decomposed, and everything leads us to believe that the protoxide of antimony passes to the state of antimonious acid soluble in hydrochloric acid, while the potassa of the stibial tartar combines with the nitric acid, of which a slight excess is always found in the carbon.

12th. That this same process, wrongfully claimed by M. Couerbe, since I pointed it out in 1832, in my "Traité de Medicine Legale," ought to be preferred to all those which are known for discovering an antimonial preparation, insoluble in water, and combined with the alimentary or solid excremental matters which might exist in the digestive canal, or which made part of the solid matter vomited, in a case of poisoning by emetic.

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† Royal Academy of Medicine, sitting of the 10th of March, from *L'Esculape*, March 12, 1840.

13th. That the extraction of metallic antimony from the viscera or from the urine of the bodies of individuals who had not submitted to medical treatment by a stibial preparation, proves incontestably that there has been poisoning, since neither the viscera nor the urine of these individuals, treated in the same manner, furnish any trace of antimony.

I will not conclude, says M. Orfila, without drawing the attention of the Academy to a point of this work which is not uninteresting. If the recent experiments of Blacke establish that certain very active vegetable poisons are absorbed and carried into all the organs *in a few seconds*, which M. Magendie had already observed as regards phosphorus, it results from mine that stibial tartar, after its absorption, does not remain long in the blood, or at least that there is not enough of it there, an hour after poisoning, to be detected by Marsh's apparatus. Arsenious acid also leaves the blood at the expiration of a certain time, but much more slowly than emetic: thus, I have not found it in the blood of dogs poisoned 22 hours previously, while I have recognised its presence at the end of three hours in the same animals, and after 13 hours in Soufflard, and the lady whom M. Casimir Broussais attended. The patient of the *Rue de Richelieu* has also yielded some traces several days after poisoning; however, I dare not affirm in the face of my new researches, that the atom of arsenic extracted from the blood of that individual did not arise from a small proportion of arsenious acid which might not have been expelled from the digestive canal by vomiting and stool, and which, having thus remained a long time in this canal, had been ultimately absorbed. Be this as it may, it is curious to see emetic and arsenious acid after having been given up by the blood and deposited in the various tissues of the animal economy, remain a much longer time and in much greater proportion in the secretory organs than in the others, before being eliminated from these viscera to be mixed with the secreted liquids; but what appears to me more important, as a physiological fact, as I will show hereafter, is the remarkable difference which these two poisons present, and they will no doubt present many others, with respect to the time during which each of them is retained by our organs.

OBSERVATIONS CONCERNING THE CEREBRAL SUBSTANCE OF A FŒTUS.*

BY M. FELIX BOUDET.

In 1821, Madeline Regnault, afterwards Martin, then 28 years of age, became pregnant, and her pregnancy went through all its periods in the most regular manner. At the presumed time of delivery, she was seized with pains completely similar to those which a woman in labour experiences, but she was not delivered; the pains ceased at the end of three months, and MM. Dubois and Boyer, whom she then consulted, detected an extra-uterine pregnancy. In the month of May last, that is to say, 18 years afterwards, she died of strangulated hernia. A *post mortem* examination was made by M. Thivet, member of the Anatomical Society, who, having opened her, found a child fixed to the viscera by very loose membranous attachments. On examining this fœtus, there was discovered above the membranes of the secundine, a demi-ossified crust formed almost exclusively of calcareous salts. This crust enveloped the whole of the fœtus, round which it formed a shell of at least three millimetres in thickness. Under this shell the skin was found perfectly preserved throughout, soft, flexible, very elastic, and in some places of a pinkish colour. Between the bones of the cranium and the dura mater there was found, here and there, masses of a matter analogous in appearance to congealed olive oil. In the cavity of the cranium not a trace of cerebral substance was found, but a fat similar to that which had been found between the bones of the cranium and the dura mater. The whole of the fat was estimated at 75 grammes; the small quantity which was sent to me had a buttery consistence, a granular aspect, melted with the heat of the hand, reddened turnsole paper slightly, and had the appearance of human fat. Heated in a silver spoon, comparatively with this matter, it distilled rapidly, spreading the same odour, and left, like it, but a slight residue of carbon, without any traces of alkali. Besides, it was composed of a solid part, and of an oily liquid analogous to oleine. The solid part, freed from the oleine by gentle pressure between two sheets of blotting-paper, and treated several times with boiling alcohol, was partially dissolved in it, at each treatment.

I saponified separately the matter which had been dissolved and that which had not, and their soaps, when decomposed, yielded each a fat acid which was very soluble in alcohol, crystallizable, fusible at 60°

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* *Journal de Pharmacie*, March, 1840.

centig., and endowed with the properties which appertain to margaric acid. Besides the neutral fats which had furnished this acid, although the small quantity which I had at my disposal did not allow of my freeing them from oleine, had fusibility much resembling that which M. Pelouze and myself have attributed to margarine. The substance, therefore, which I have examined, should be considered as a mixture of oleine and margarine, identical with the human fat; I should add, however, that it appeared to me to contain a small quantity of the white fatty matter first observed in the brain by Vauquelin, and for which M. Couerbe has proposed the name of cerebrote. Our present knowledge concerning the constitution of the cerebral substance will not permit me to explain the curious fact which I have just mentioned: it is to be hoped, however, that the recent experiments of M. Frémy, (see the *Chemist*, No. III., page 79,) which tend to make us regard this substance as essentially formed of two saponified fats, will lead one day to the discovery of some relations between it and the fatty matter of the human body.

POISONING BY NIGHTSHADE BERRIES. (SOLANUM NIGRUM).*

Black nightshade has long been considered as a narcotic plant, and its berries as very poisonous, having caused the death of children who had eaten them in mistake for currants. M. Dunal of Montpellier thinks that in this case it is not the berries of the black nightshade which produce these deleterious effects, but the fruit of the belladonna. He has expressed this opinion in consequence of some experiments which he has tried on himself, and on animals, and which lead him to think that this plant is by no means dangerous. M. Guillemin (*Dictionnaire des Drogues*) also says that the leaves and fruit of black nightshade are far from possessing all the narcotic properties attributed to them. However, M. Desfosses has found solanine in the juice, which alone ought to make us very careful. In corroboration of this we may refer to a work of M. Bourgoyne, physician at Condé, published in the *Journal de Chimie Médicale*, 1827, relative to the deleterious effects of this plant on sheep. As the opinion establishing the deleterious effects of black nightshade berries may become the source of serious accidents, we give the following observations which M. Pihan Dufeyllay has lately published in the *Journal Académique* of the Lower Loire.

Three children, residing in a village near Nantes, went out on the 27th of August, 1838, to play: they returned at night, asking for water to quench their thirst, and went to bed without desiring any supper: in the middle of the night, the eldest of these children, aged nine years, who sat up, complained before going out of a slight pain in his head, uttering groans caused by a violent cephalalgia; he complained of nausea and colic, making efforts to go to stool, but being unable to do so. There soon came on copious vomitings of mucous matters at first, then of a thick, blackish green liquid: the pupils were extremely dilated; he scarcely distinguished the surrounding objects; his face was distorted, and a copious perspiration ran all over his body; his thirst was unquenchable, and he complained perpetually of a violent head-ache; he soon became speechless, respiration became stertorous, the body was seized with tetanic symptoms, and the child died at two o'clock in the morning, before assistance could be procured.

While this child was sinking, his brother, aged five years, began to complain of vertigo, nausea, and colic; like him he vomited alimentary matters, then a blackish green liquid. It was next day, the 28th, that M. Pihan Dufeyllay was called in to him, assisted by Dr. Morisson. These physicians found the little patient lying on his back, in a prostration, now and then interrupted by convulsive movements. The face was swelled and distorted, the pupils alternately dilated and contracted, the skin burning and covered with perspiration, the pulse frequent, and rather irregular: thirst was very keen, but liquids were instantly rejected by vomiting. Leeches were immediately applied behind the ears. At night the symptoms were more serious; the coma was more profound. Leeches were applied to the legs. Next day, the 29th, the coma, the convulsive agitation, and the plaintive cries continued. More leeches were applied to the ears, and a purgative was ordered which was rejected immediately; then blisters were put on the legs, and frictions were made with Neapolitan ointment, behind the ears and on the lateral parts of the neck, half a drachm every half hour.

In the mean time the sister of these, aged three years, was seized with exactly similar symptoms. It was then that, struck with the similarity of the symptoms in three persons of the same family, the physicians suspected an identical cause. After numerous questions, they learnt from a child in the neighbourhood, that the two eldest had gathered and eaten abundantly a kind of fruit, and that they had given some to their sister: this fruit, as described to them, was that of the *solanum nigrum*, or black nightshade; the poisoning was evident. Under the influence of energetic treatment, the symptoms were dissipated; but under a too rapid alimentary regimen, these children suffered relapse, and fell into a long and dangerous illness.

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* *L'Esculape*, March 7th, 1840.

These observations appear to us so much the more worthy of interest as they tend to fix the opinion of physicians concerning the poisonous properties of a plant, whose leaves, when boiled, are eaten in some countries as food.

ON GARLIC (ALLIUM CEPA).*

It is known that garlic, much used as a condiment, particularly in southern regions, has also been employed medicinally; 1st, as a prophylactic; 2d, as a vesicant; 3d, as a resolvent; 4th, as a vermifuge; 5th, as a diuretic; 6th, against gravel and stone; 7th, against dropsy; 8th, against intermittent fevers; 9th, against hemorrhoids, &c.

A practitioner, in one of the sittings of a medical society, has called the attention of physicians to this vegetable: he has thus given his conclusions:—

1st. The use of this substance may render real service in medicine to the poor and country people.

2d. The local or physico-chemical action of garlic is incontestably irritant, but it should not be confounded with the dynamic action which depends on the absorption of the volatile oil that its substance contains, and which may be of an opposite nature.

3d. The dynamic or constitutional action of garlic seems analogous to that of squills, and it may probably be employed as an antiphlogistic remedy in many diseases.

4th. It is very probable that, administered in a large dose, garlic acts as a cold or asthenic poison, and that its effects demand the use of stimulant remedies; but science being deficient in facts on this subject, we can only express the wish that experiments be made on animals.

These conclusions have given rise to objections on the part of MM. Bourjot-Saint-Hilaire, Bricheteau, Gilette, and Nonat.

All these objections, which we need not relate, show that garlic deserves to be made the subject of investigations, with the view of ascertaining, 1st, its chemical composition; 2d, its therapeutical properties; 3d, its toxical effects on the animal economy.

We may also say that garlic is not altogether abandoned, and that we know medicines of which it is an ingredient; such are:—

1st. The pills (*antiglaireuses*) described in the formulary of Bories, and in Pierquin, *Memorial Pharmaceutique*.

2d. The anti-hemorrhoidal kind mentioned in the pharmacology of Paris.

3d. The hemorrhoïdal fomentation described in *Dispensaire Medico-pharmaceutique du Palatinat*.

4th. The syrup of garlic in different dispensaries.

5th. The hydragogue apozem, formulary of Bories.

6th. The vinegar of garlic.

7th. The oximel of garlic of the pharmacopœia printed at Wurzbourg, *Pharmacopœia Herbipolitana*.

8th. Antiseptic vinegar.

9th. Finally, compound antiseptic vinegar (formulary of Bories).

SUBSTITUTE FOR JALAP.†

The seeds of the *Ipomea cærulea*, the kaladana, or mirahai of the Indian bazars, one of the Convolvulaceæ, which grows abundantly in every hedge and jungle in Bengal, when reduced to powder, and given in doses of from twenty to thirty grains, purges freely, without griping, in from two to three hours. It has been extensively tried in the Native and Police Hospitals of Calcutta, and has been in every case found superior to jalap; inasmuch as it is nearly tasteless, and operates freely, without producing the griping which jalap almost invariably occasions.

THE CEYLON MOSS.

This plant has long been employed in India in the preparation of a very nourishing jelly. It contains more nutritive gelatinous matter than either Iceland or Carageen moss, and it is quite without their disagreeable taste. The superiority of the jelly made from this moss consists in its suitableness to very delicate stomachs, being more easy of digestion than the mildest animal jelly.

EXAMINATION OF AN ANIMAL TINCTORIAL POWDER, CALLED SYRIA.‡

BY M. J. J. VIREY.

There is imported from London a powder of a very deep violet-reddish brown, very heavy, inodorous and insipid, but tinging the saliva a beautiful carmine red. This powder is dense and rather volatile; it communicates either to water or alcohol a fine deep solid purple tint. Nitric and acetic acids, &c., give it an orange or rather yellow tint, which resumes, however, in the air a more violet aspect. The alkalies turn the colour to bluish purple.

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* *L'Esculape*, March 7th, 1840.

† *Quarterly Journal of the Calcutta Medical and Physical Society*, July, 1838.

‡ *Journal de Pharmacie*, March, 1840.

It was first necessary to know the nature of this product: placed on a red-hot iron plate, it gave white thick vapours, of an animal nature, and left only a turgid carbon, difficult to incinerate. This character thus manifested the essentially animal nature of the powder.

It was then desirable to discover in what order of animal substances might be found the origin of this powder staining of a carmine red.

We have thought, therefore, that as there is collected more particularly in the East, Asia Minor, or the Levant, a great quantity of animal kermes, *coccus ilicis*, we were at first contented to express from it the purple juice so rich in the coccine of Lassaigne, which is analogous to the carmine of Pelletier, extracted from cochineal. But it is known that after expressing the juice of kermes employed as a dye, or for syrups, exciting liquors much used in the East (altermes, &c.), the residues, the remains of these insects containing the semi-horny cover, and the other organs dried in balls, remain abandoned as almost useless. The greater portion of these residues, indeed, is composed of the horny substance, common to most insects, and called *chitine*, with some mineral salts (phosphate and carbonate of lime) which ordinarily accompany it.

But it was easy to ascertain that these remains still retained a considerable quantity of coccine, the red colouring matter.

It is, therefore, sufficient to pulverize these dried residues of the kermes, and in order to give an Oriental name to this matter with a view to enhance its value, it has been disguised under the name of *Syria*,* or Syrian powder.

It is evident that a very great quantity of purple colouring matter, and a more or less solid tincture may be obtained from this powder, but we have not remarked whether these are such lively, brilliant and pure tints as the carmine of cochineal presents in its most beautiful preparations; however, it is probable that syria will be found very useful in dyeing, and for colouring paper, tissues, and a number of objects in daily use.

ADDITIONAL NOTE.

In might be suspected that lac-lake or lac-dye might contribute to the formation of this tinctorial powder, because both afford a purple colour. But the samples of lac-dye, in cubic violet-red brown lumps, such as we have described in the *Journal de Pharmacie* for 1821, vol. vii. page 523-4, at the conclusion of our memoir on lac-resin, are not completely incinerable in the fire like *syria*. Moreover, lac-dye contains also a portion of friable magnesian talc, which has received the colour in such a manner that it may be used as a water-colour, which is by no means the case with syria; it does not yield earthy matter, nor does it effervesce with acids, according to my experiments. It has, nevertheless, a greater specific gravity than lac-dye, for the latter retains a portion of the resin of the lac in the caseum of milk, with the assistance of soda, afterwards precipitated by citric acid. On the contrary, syria, equally soluble, as regards its tinctorial part, in water and alcohol, does not contain so much resin as lac, or even as lac-dye.†

Such are, therefore, the differences between these tinctorial matters.

NEW SUBSTITUTE FOR SULPHATE OF QUININE.‡

We read in a journal the following article:—*New substitute for sulphate of quinine.* M. Rigatelli assures us that he has discovered an indigenous substance which may advantageously be used for sulphate of quinine: he calls this substunce *salino amarissimo antifebrile.* A commission, named by the Academy of Verona to make a chemical and therapeutical examination of the medicine, has found that this saline substance is derived from the indigenous vegetable kingdom, as spread over Europe; that it is obtained by a simple process and in considerable quantity; that it is composed of an acid in combination with a vegetable alkali, and that it does not contain any thing prejudicial to health. The salt is friable, of an earthy appearance, of a brick-red colour, and of a more astringent and bitter taste than sulphate of quinine; the little smell it has is herbaceous. Powdered, this substance turns white and becomes very soluble in water; numerous observations have proved that it may advantageously be substituted for sulphate of quinine, in all cases wherein the latter is recommended.—(*Litt. ann. den Heilkunde.*)

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* It should be called *Pulvis Syrius.*

† Cochineal, *coccus cacti*, animal kermes, *coccusilicis*, the shell-lac insect, *coccus lacca*, of Kerr, are three animals of the same species, frequenting vegetables with more or less red juices, with which they are nourished. However, they furnish much more beautiful purple colours than can be extracted from those plants. It is the same with the cochineal of Poland (*coccus scleranthi*), but the cochineals of the fig, of the orange and olive-trees, &c., do not furnish these rich dyes, perhaps because they do not exist in the *latex* or juices proper to those trees.

‡ *L'Esculape*, March 7th, 1840.

We had wished that the article on the discovery of M. Rigatelli were more explicit, and that it had informed us in a positive manner what this discovery of M. Rigatelli is, a discovery of which the date extends as far back at least as 1821, and which has remained unknown since that time. To give here a proof of what we advance, we may quote an article extracted in 1826 by M. Olivier, of Augers, from the *Journal Atti dell'Academia d'Agricultura, Commercio, ed arti di Verona* :—

"New salt, whose properties equal those of sulphate of quinine, discovered by M. Bart. Rigatelli."*

The plant which has furnished M. Rigatelli with the new salt of which he announces the discovery, grows in the environs of Verona, and for four years many distinguished practitioners have proved the advantageous effects of this medicine, having employed it frequently and successfully in circumstances wherein quinquina is recommended. Particular motives oblige M. Rigatelli to conceal for a time (1826), the name of the plant which yields this new febrifuge; he wished, nevertheless, to submit the subject of his discovery to the Academy of Verona, the members of the commission being besides engaged to keep the secret for a certain time. The conclusions which the commission has published are as follows :—

1st. The vegetable which furnishes the new salt is *very common*, not only in the States of Verona, and the Lombardo-Venetian kingdom, but even throughout Europe.

2nd. This salt is obtained by a very simple process, in considerable quantities, relatively to those of the vegetable employed; the expences are nothing compared with those which the preparation of sulphate of quinine requires.

3rd. This matter does not contain any principle which can exercise an injurious action on the animal economy, and consists in the combination of a liquid with a vegetable salifiable principle.

4th. Not powdered, this new salt has a brick-red colour, a friable consistence, a taste much more bitter than that of a sulphate of quinine, slightly astringent, and of scarcely perceptible herbaceous odour.

5th. Reduced to powder, the characters of this salt are the same, but it dissolves rapidly in water, and acquires a whitish colour.

6th. There is a great resemblance between this salt and sulphate of quinine, the bitterness of which is much less decided; from its advantageous and well-attested effects in certain fevers, it results that it is possessed of the same properties as sulphate of quinine, and that it may be employed with equal success in all cases which demand the exhibition of quinquina or quinine.

7th. Lastly, its very moderate price should make its use generally preferred to that of sulphate of quinine, especially in hospitals and almshouses.

OBSERVATIONS ON SNAILS.†

BY OSCAR FIGUIER.

It is generally believed that the medicinal properties of snails are owing to a mucous and mucilaginous body, which the flesh of these molluscæ contain in abundance; we are obliged, in pharmaceutical operations connected with snails, to preserve this mucous principle especially, and to eliminate the others. Now, the preparations made with this view are inefficient, or derive their properties only from the principles associated with them; while the clinical experiments of M. Chrestien and other practitioners of Montpellier, testify that few agents are so useful, in affections of the chest, as snails, taken whole and without other preparation.

The experiments of M. Figuier related to the officinal snail (*Helix pomatia*). To separate the mucus from the snail, he availed himself of the process of M. Mouchon, which consists in beating up the flesh of snails cut in pieces, in three times its weight of water, with a sprig of willow; it is then evaporated on a stove. He obtains a dry matter, of a yellowish white colour, which water swells up much without dissolving it. It is insoluble in the acids, and very soluble, on the contrary, in the alkalies.

By treating with ether the flesh of snails thus deprived of the mucilaginous parts, M. Figuier has extracted from it an oily matter, which, according to him, contributes almost solely to the medicinal properties of snails. He has given it the name of helicine, although it is a matter of a very complex nature. Helicine is oily, transparent, of a very slight yellow colour, of a peculiar odour, and of a disagreeable characteristic taste; alcohol dissolves it readily, alkalies saponify it, and acids separate it, endowed with still stronger smell, which seems to announce in helicine a matter analagous to hircine and phocenine. M. Figuier, has discovered sulphur in helicine; it contains 1·4 per cent.; and he draws from this observation the consequence, that helicine, as is the case with many other sulphurous matters, should act in diseases of the chest, and that it ought to be much accounted of in the medicinal effects of the snail; and as he has found only traces of sulphur in the mucus of the animal, he admits that the latter is inert, and that all the effect produced should be referred to helicine; an opinion which will doubtless appear a little exaggerated.

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* It appears that M. Rigatelli has not imitated the generous example given by MM. Pelletier and Caventou, who, preferring fame to fortune, have not sought to appropriate to themselves immense sums which they might have obtained, either by keeping secret their process of extraction, or by taking out a patent which would have procured them a monopoly: the example of MM. Pelletier and Caventou has been followed in France by many chemists.

† *Journal de Pharmacie*, February, 1840

M. Figuier has found in the shell of snails much carbonate of lime, traces of sulphate of lime, phosphate of the same base, and a mucous matter. He has also examined the excrements of these animals, expecting to find uric acid in them, but he has not discovered it. M. Figuier being occupied with pharmaceutical preparations of which snails are the base, contests the opinion put forth by M. Mouchon, and urges the necessity of submitting the snails to fasting before administering them; he quotes on this occasion the following observations, which are but little known. M. Reussi saw in Milan a case of poisoning, caused by three snails, taken in a ditch in which grew hemlock and belladonna (*Ann. Clin. de Montpellier*, No. 171); moreover, M. Gaspard relates, according to M. Guillaume (*J. de Physiol.* No. 1), that during the scarcity of 1817, when individuals fed on snails, those who did so to excess, presented a state of stupor and narcotism, which certainly ought to be attributed to the peculiar nourishment of these animals. Experience has proved, on the contrary, that at the end of a month's abstinence, snails have never offered any inconvenience when used as food.

M. Figuier admits, as a principle, that pharmaceutical operations should tend to introduce all helicine in the preparations, to avoid the employment of a high temperature, which would alter the sulphurous principle. To that end, he introduces all the substance of the body of the snails into the preparations, and always operates at a temperature which does not exceed 100°.

1 part of flesh ground with 5 parts of sugar, the matter, being dried on the stove, forms the syrup of snails, which, reduced to a paste, by means of a mucilage of gum tragacanth, furnishes lozenges. M. Figuier makes a paste of snails analogous to that of marshmallow. It contains one-eighth of snails' flesh. He has also given a formula for chocolate and the syrup, which, in our opinion, he has done wrong to complicate by introducing into it a great quantity of sweet and bitter almonds.

FORMULÆ FOR THE CONCENTRATED TINCTURES OF HAENLE.*

These preparations have been examined by a commission of health, which has ordered it to be printed in the Pharmacopœia of Baden.

This is the *modus faciendi*:—

Substance in very fine powder ..	8 parts.
Alcohol at 32 B	16 parts.

The whole is put into a close vessel to be digested four days at a heat of 16° or 18° Reau., taking care to stir it occasionally; it is afterwards pressed and filtered; to the residue is added as much alcohol as the powder has absorbed; it is again pressed and filtered; the two liquors are united; the total weight ought to be 16 parts, that is, double that of the powder employed. In this manner may be prepared:—

TINCTURE OF ACONITE.

Which is of a dark brownish green, at 14° Reau. Its specific gravity is 0·860. By the addition of water, this liquid becomes turbid, and takes a yellow colour.

TINCTURE OF ARNICA FLOWERS.

Colour brownish yellow, strong odour of arnica; specific gravity, 0·860. Gives a yellow colour to water.

TINCTURE OF BELLADONNA.

Colour, greenish black; odour, narcotic; specific gravity, 0·846. It turns water of a greenish yellow, but more green than that of aconite.

TINCTURE OF CHAMOMILE FLOWERS.

Colour, reddish brown; saturated, it has a strong odour of chamomile; specific gravity, 0·867. It imparts to water a brownish-white colour.

TINCTURE OF CICUTA.

When saturated it has a blackish-green colour; odour, that of cicuta; its specific gravity is about 0·863. It has the same effect on water as that of belladonna.

PURPLE TINCTURE OF DIGITALIS.

Saturated, colour, blackish green; very little smell; specific gravity, 0·869. It scarcely troubles water, but the colour is greenish yellow.

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* *Journal de Chimie Médicale*, March, 1840.

TINCTURE OF HYOSCYAMUS.

Colour, blackish green; the narcotic smell of hyoscyamus; specific gravity, 0·855. It has the same effect as that of belladonna on water.

TINCTURE OF IPECACUANHA.

Colour, brownish yellow; specific gravity, 0·855. Causes water to become whitish.

TINCTURE OF PEPPERMINT.

Saturated, colour, blackish green; odour, that of peppermint; specific gravity 0·863. Turns water green.

TINCTURE OF SAVINE.

Colour, blackish green; odour, that of savine; specific gravity, 0·876. It colours water yellowish green.

TINCTURE OF SERPENTARIA.

Colour, reddish brown; the peculiar odour of serpentaria; an aromatic taste resembling camphor: specific gravity, 0·858. It turns water yellowish white.

TINCTURE OF VALERIAN.

Of a reddish brown colour; odour, that of valerian; specific gravity, 0·862. It imparts to water a yellowish-white colour.

PROCESS FOR PREPARING LACTATE OF PROTOXIDE OF IRON.*

BY M. LARADOUR.

M. Laradour extracted lactic acid from whey procured, in the neighbourhood of Paris, at dairies where much cheese is made. This whey, allowed to ferment for a long time under the influence of a high temperature, yields a considerable quantity of lactic acid. Evaporated to a third or a fourth of its bulk, decanted and filtered, it is afterwards saturated with milk of lime, which causes an abundant precipitate, formed in great part of a calcareous phosphate. The filtered solution is afterwards precipitated by oxalic acid; it is to be filtered again, and the liquid concentrated until it acquires a syrupy consistence. Alcohol is then added to precipitate the lactine and the salts. It is filtered, the alcohol is distilled over, and pure lactic acid is obtained. Lactate of protoxide of iron is prepared by digesting with the sand-bath, at a gentle heat, this acid, diluted with iron filings. After six or seven hours' reaction, the liquor should be boiled, filtered, and concentrated; the crystallized salt is then obtained by cooling. The crystals, drained in a funnel and washed with alcohol, should be rapidly dried and shut up from the contact of the air.

This salt, as M. Laradour has shown us, and as we have observed ourselves, by following his process, which is of easy execution and very cheap, is presented under the form of very white crystalline plates, which are but little liable to alteration. It is rather soluble in water, reddens turnsole paper, and possesses the ferruginous taste to a supportable degree; when it is dissolved in water, it is superoxidized and becomes yellow very quickly.

The sparing solubility of lactate of iron has allowed M. Laradour to render his process still more simple by suppressing the purification of the lactic acid with alcohol, and treating it at once by iron filings. The liquor, evaporated in a suitable manner, allows the lactate to crystallize, the foreign salts and the lactine remain in the supernatant liquor, which may be thrown away.

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[*] *Journal de Pharmacie*, March, 1840.

ON THE EMPLOYMENT OF TWO NEW PROCESSES FOR DETECTING AND ISOLATING ARSENIC IN ORGANIC OR INORGANIC MATTERS CONTAINING IT.†

BY M. PERSOZ.

It results from the researches of M. Persoz, that the arsenic contained in an ore or in an organic substance, being previously transformed into an arseniate, may always be isolated and separated by causing the arsenic acid to pass to the state of arsenious acid, whether by sulphurous acid or by chloride of ammonia. This arsenious acid is afterwards converted into a sulphuret of arsenic by means of a hydrosulphuret.

[†] *Comptes Rendus*, No. 12, March 24, 1840.

TO CORRESPONDENTS.

Nota Bene.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher*, 13, *Carey-street, Lincoln's-Inn Fields, London." All communications must be sent before the* 15*th of each month.*

We are unavoidably compelled to defer answering Mr. Thomas, of Shaftesbury, and Mr. Wilson, until next month.

Mr. Bartlett's communication we are also obliged to postpone.

Mr. Newbery's communication, for which we are indebted to him, came too late for insertion this month, but shall appear in our next.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

CONTRIBUTIONS TO THE HISTORY OF ALCOHOL, OF PYROXYLIC SPIRIT, AND OF ETHERS.*

BY M. F. KUHLMANN.

My object in this paper is not to devote myself to speculations relative to the chemical constitution of ethers, but to extend the facts which alone, it appears to me, should lead us to found upon immoveable bases, this very important part of our theories.

I have, therefore, made all my experiments without giving them any special direction towards a settled system; and in my equations, I have always employed the formulæ, $C_4 H_{12} O_2$ and $C_2 H_8 O_2$ to designate alcohol and pyroxylic spirit.

I. I have divided my work into five parts. —In the first, I take a general view of the combinations which alcohol and ether form with bodies which have a great affinity for water. After having pointed out the circumstances in which alcohol and ether act the part of water of crystallization, I am led to attribute to these bodies the part of acids or bases when they form compounds which present all the characteristics of a saline matter. It was not without some hesitation that I admitted the existence of alcoholic compounds in which alcohol acts as a base. In the present state of our knowledge concerning the constitution of alcohol, which leads us to look upon this body as a hydrate of ether, I should be led to regard the combinations of alcohol as combinations of ether and water. Without doubt, nothing prevents us from looking upon them thus; but nothing forcibly induces us to do so: and certainly, in examining the question without the preoccupation of our theories concerning the constitution of alcohols and ethers, we shall, without difficulty, admit the existence of alcoholic compounds, however little stability these compounds may present in some circumstances. These are, however, questions which I leave to the sagacity of the authors of the various theories of etherification.

I thought it necessary to admit the existence of alcoholic compounds, because I had to distinguish these bodies from another equally numerous series of compounds, which I obtained directly by the combination of ether with bodies which have a great affinity for water, and whose properties differ essentially from those of alcoholic compounds. Thus, while by the action of water my alcoholic compounds always yielded alcohol, my ethereal compounds always gave ether; while such alcoholic compounds are altered by heat, yielding ether, oil, &c., the corresponding ethereal compounds are volatilized without alteration: of this number are the ethereal compounds formed by perchloride of tin. Other alcoholic compounds are evaporable without alteration, and are transformed into ethereal ones only under the influence of a temperature of about 140° C.: such is the combination of alcohol with fluoride of boron.

That which I here say of alcohol, as regards the combinations into which it enters, is equally applicable to pyroxylic spirit.

I have shown that the basic part belongs not only to alcohol, pyroxylic spirit and sulphuric ether, but that the ethers of the hydracids are in the same conditions. have published the result of some experiments concerning this kind of compounds.

II. In the second part of my work, I devote myself to the action of heat on alcoholic and methylic compounds: first those wherein alcohol and pyroxylic spirit act the part of acids; next, those in which these bodies form the electro-positive element of the compounds.

The combinations of powerful bases with alcohol or pyroxylic spirit never yield ether by the action of heat: their decomposition takes place in general only at a moderate temperature, and the parts of alcohol or pyroxylic spirit which are retained, are decomposed only towards the temperatures of 250° C., and then give rise to gaseous hydrocarburets, and, in some instances, to an empyreumatic oil.

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* *Journal de Pharmacie*, April, 1840.

The combinations of alcohol and certain metallic chlorides always yield ether towards the temperature of 140°, when the combination is submitted to the action of heat with an excess of alcohol: the ether which is then disengaged, is partly sulphuric. When we operate with an excess of etherifying chloride, there is produced only hydrochloric ether, which, in the latter case, may be obtained at the temperature of 85° to 90°. Ether is not always disengaged in the free state: in operating with volatile chlorides, it is often obtained in combination with those chlorides, especially towards the end of the distillations.

By distilling a mixture of 100 parts of perchloride of tin with 53·79 of absolute alcohol, or 2 atoms of perchloride and 3 atoms of alcohol, the greatest proportion of ether is obtained. For perchloride of iron, the best proportion is that of 100 of perchloride, and 57·82 of absolute alcohol; that is to say, two atoms of alcohol, and one atom of perchloride of iron. When greater proportions of alcohol are used, the excess distils without decomposition before etherification takes place.

The presence of a little water may render modifications in the proportions indicated necessary, but does not prevent etherification.

The mixtures of alcohol and perchloride of tin, or anhydrous perchloride of iron, made in proportions which are represented by the formulæ, $2\ Sn\ Cl_4\ 3\ C_4\ H_{12}\ O_2$ and $Fe.\ 2\ Cl_6,\ 2\ C_4\ H_{12}\ O_2$, may be kept for fifteen days, *in vacuo*, without losing any portion of the bodies associated, and without undergoing any alteration.

The constitution of ethereal compounds takes place also in simple proportions, which seem to correspond to those which preside over the formation of alcoholic compounds. By making a mixture of 100 parts of perchloride of tin, and 57·88 of absolute ether, which represents two atoms of ether and one atom of perchloride, and by placing this mixture in the vacuum, at the ordinary temperature, an excess of ether, representing ¼ of the quantity employed, is volatilized; therefore, the formulæ of the compound which remains should be $2\ Sn\ Cl_4,\ 3\ C_4\ H_{11}\ O$. By heating this product, *in vacuo*, to 40° or 50°, it distils, and is condensed in the neck of the retort in beautiful brilliant crystals, presenting the form of rhomboidal tables.

Etherification has been produced by the action of heat on the alcoholic compounds of perchloride of antimony, of chloride of zinc, and cloride of aluminium. The latter gives only hydrochloric ether. Chloride of arsenic did not yield any ether. The action of heat on the compounds of alcohol and fluoride of boron gives, at 140°, an ethereal combination which is distilled: before 140°, part of the alcoholic compound is evaporated without alteration. The product in the retort is transformed into an etherial compound yielding ether by its mixture with water. By operating with perchloride of tin, the residue in the retort, after the disengagement of part of the ether, always gives alcohol, by the contact of water. This difference may be attributed to the great volatility of the etherial compound of chloride of tin, which is the reason that this compound escapes in vapour from the time that it is produced, which is not the case with the compound of ether and fluoride of boron, which is not evaporated until towards 140°. The fluoride of silicium does not give rise to the etherification of alcohol.

III. After the etherification of alcohol by the metallic chlorides and fluorides, I proceed to examine the action of these agents on pyroxylic spirit at an elevated temperature. I have said that pyroxylic spirit formed combinations corresponding to those of alcohol. The action of heat on those compounds wherein pyroxylic spirit acts the electro-positive part, presents a great analogy with that which it exerts on the alcoholic compounds. When, in the mixture of pyroxylic spirit and etherifying chloride, the former predominates, there are formed, as is the case with alcohol, two kinds of ether: a peculiar methylic ether, which is condensed at the temperature of 0° C. and remains liquid at the ordinary temperature, and hydro-chloro-methylic ether, which is condensed only at very low temperatures. When the chlorides are in excess the latter ether alone is produced. The temperatures at which the etherification of pyroxylic spirit takes place, are generally lower than those required for etherification of alcohol. These temperatures are from 125° to 150°. The proportion best adapted for producing the etherification by perchloride of tin seems to be that of two atoms of pyroxylic spirit and one atom of the perchloride. The action of the etherifying chlorides on pyroxylic spirit differs from that produced on alcohol, in this respect, that with pyroxylic spirit the mixture is always of a brownish red color, and that, by the addition of water, a matter of a resinous appearance is precipitated, which does not occur with alcohol: indeed, the residues of the distillation always contain a resinous matter, or carbon, and the chlorides are there found reduced to the state of proto-chlorides.

Fluoride of boron transforms pyroxylic spirit into ordinary methylic ether, whi very difficultly condensable: this ether is never disengaged in an isolated state, but always in combination with fluoride of boron, from which it is separated by water.

Fluoride of silicium does not yield ether with pyroxylic spirit, any more than with alcohol.

IV. The fourth part of my work relates to the action of anhydrous sulphuric acid on absolute alcohol. I have proved that, contrary to the generally admitted opinion, sulphuric acid could also transform absolute alcohol into ether, and I have published the condition in which this transformation takes place.

I have shown that a mixture of two atoms of anhydrous sulphuric acid and one atom of absolute alcohol never yielded ether, but that by employing a mixture constituted of one atom of each, etherification took place at the ordinary temperatures, namely, from 140° to 160°. When a greater quantity of alcohol is employed, the excess is distilled over before etherification: but when the quantity of acid is increased a little, a greater quantity of ether is obtained. The proportions which I have found to yield most ether are those of four atoms of acid and three atoms of absolute alcohol.

Etherification by anhydrous phosphoric acid takes place only very incompletely and by operating with an excess of alcohol.

Anhydrous pyroxylic spirit, when it predominates in the mixture, yields, with anhydrous sulphuric acid, methylic ether.

The simplest way of accounting for etherification, as much in what relates to the chlorides as to the anhydrous acids, consists in assimilating the decomposition of the neutral, or even basic alcoholic compounds, in what concerns the chlorides, to the decomposition of many ammoniacal salts, which, when neutral, pass, by the action of heat, to the state of acid salts, by losing ammonia; with this difference, however, that when alcohol is displaced at the temperature of 140 or 150°, it is converted into ether and water. The water is partly retained by the acids, and may even be entirely decomposed by the etherifying chlorides, giving rise to hydrochloric acid and to oxide.* This mode of viewing the phenomenon of etherification easily explains how sulphuric acid can transform into ether and water an almost unlimited quantity of alcohol of proper density, added gradually to the etherifying mixture; it is not necessary to have the intervention of an occult force, as MM. Mitscherlich and Berzelius have proposed.

In considering etherification by the hydrated acid as the result of the decomposition of a bisulphate of alcohol, or ether and water (sulphovinic acid), the reaction is again accounted for by attributing basic properties to the water. Water partakes, indeed, in these reactions, for I have shown that, although two atoms of anhydrous acid do not yield ether with one atom of absolute alcohol on account of the excess of acid, a great quantity of ether is obtained by employing two atoms of hydrated acid.

In all cases of etherification, the decomposition of the alcoholic compounds must take place at the temperature of 130° or 140°. I have given evidence of this fact in the last part of my work.

V. I have shown that when we distil *in vacuo*, a mixture of two atoms of hydrated sulphuric acid and one atom of absolute alcohol, which mixture, under ordinary circumstances, yields ether, boiling commences at 50° C., alcohol is distilled over until 104° C., when it passes to the state of oil of wine, and water, without ether.

Analogous results occur with etherifying chlorides: there is not much hydrochloric ether formed: but with these bodies no oil is distilled, even at the temperature of 160° C.

In the reaction by sulphuric acid, the formation of oil of wine without ether, at the temperature of 104°, after a disengagement of alcohol, is worthy of remark: it shows that for etherification in general the temperature of about 140° is absolutely required.

As to the oily carburets, they may be obtained even cold; which is shown by the slow action of fluoride of boron on absolute alcohol.

Among the numerous experiments described in this work, there are, doubtless, many which deserve a more extended examination. Such are the reactions of the anhydrous acids and chlorides on the ethers of the hydracids, and consequently on the organic ethers; the slow action of the etherifying chlorides and fluorides on alcohol. Analytical investigations are also necessary to fix our ideas on different points, especially on the nature of the liquid methylic ether produced by the chlorides; on the crystalline compound obtained by the action of water on the product of the slow decomposition of fluoride of boron by alcohol: it is likewise necessary to investigate the analogy existing between the compounds which I have described and the products designated under the name of the etherial salts of Zeize. It would have been agreeable to me to complete my investigations; but, being prevented by manufacturing occupations from pursuing this work at present, I thought, in the interest of the theoretical questions attached to it, that I ought to give them up, however imperfect they may be, to the knowledge of chemists, calling their attention to the various points which are left undecided.

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* Of the metal formerly combined with chlorine, but which has separated from it that it may form a chloride.—SUB.-ED. CHEMIST.

ON THE CHEMICAL POWER OF THE ELECTRIC CURRENT, CONSIDERED IN ITS RELATIONS TO AFFINITIES.*

BY M. BECQUEREL.

I have long devoted myself to investigations, the object of which is to determine accurately the relations existing between the powers which retain heterogeneous atoms united in chemical compounds. From a deficiency of precise means, all my attempts were at first unavailing: but having resumed this subject some time since, I have been fortunate enough to discover a more successful mode of experimenting.

In a binary compound, the power which unites two different atoms to each other varies in its intensity according to temperature, pressure and other causes. Although the nature of this power is not known to us, we have every reason to suppose that it is electric: however, be that as it may, it is very essential to ascertain its intensity, or the degree of energy with which it acts in certain circumstances, when it is compared with another as unity, if we desire to establish a relation between the powers which regulate the combination of one body with two others, that is to say, between the affinities in virtue of which the compounds which result from that combination exist.

Suppose that we were able to lay hold, with exceedingly delicate pincers, of each atom of the combination, and draw them in the opposite direction to their mutual attraction; the power required to overcome that attraction would serve as a measure for it. Instead of an apparatus of this kind, which it is impossible to realise, we have electric currents which, properly employed, are capable of fulfilling the same functions. The principal thing required is to find a means of dividing a current which passes through a solution of two compounds, into two parts, so that each of them may separate one equivalent from another in each compound.

Several principles are required in order to effect this. The first was discovered by Mr. Faraday, and consists in the equivalents of bodies being united, or rather, associated with an equal quantity of electricity; so that the same current which passes into two metallic solutions, operates their decomposition in such a manner that equivalents of each metal are deposited on the metallic plates. This occurs when the two solutions are in separate vessels: but when they are mixed there result compound effects which allow of comparing the affinity of an acid for two different bases. Being unable to detail here the experiments which I have made, on account of their great number, I shall mention only the consequences to which they lead.

By subjecting to the action of the same current, mixed solutions of nitrate of copper and nitrate of lead, of nitrate of copper and nitrate of silver, and of nitrate of lead and nitrate of silver, in equal atomic proportions, it is found that the decomposition is effected in definite proportions, and that in the mixture of the solution of nitrate of silver and nitrate of lead, as well as in that of the solution of nitrate of copper and nitrate of silver, the nitrate of silver only is decomposed, whilst, in the mixture of the solutions of nitrate of lead and nitrate of copper, the nitrate of copper only undergoes decomposition. It is proved, therefore, that the current exerts its decomposing action, in preference, on the nitrate in which the affinities of the oxygen and nitric acid for the metal are least.

If the atomic proportions of the nitrate of copper in the mixture of nitrate of silver and nitrate of copper, be gradually increased, after a time the precipitate ceases to be crystalline; it becomes flaky and tuberculous: its parts are then in such a state of division that it would be very difficult to weigh them. From this molecular state it seems to result, that the mass of nitrate of copper, as it is increased in the solution, exerts an attractive action on the particles of silver, at the moment when they are deposited on the negative plate, and in such a manner as to prevent them from aggregating, or, at least, to prevent the power of cohesion from being exerted.

Very accurate experiments have shown that by operating on a decigramme of nitrate of silver and rather more than 60 equivalents of nitrate of copper, copper begins to appear in the precipitate. By increasing the equivalents of nitrate of copper to 67, the metallic precipitate is then composed of one equivalent of silver and one of copper. According to Mr. Faraday's principle, this result can be obtained only when the current is divided into two perfectly equal parts, since the equivalents of bodies, being associated with equal quantities of electricity, require two currents of the same intensity, to separate them. From this it may be inferred, that the power which unites the oxygen and nitric acid to the silver, in the nitrate of that metal, when there is in the solution an atomic part of this compound equal to 0·1g. is the same as that which unites the oxygen and nitric acid, when there are in this solution 67 atomic parts of nitrate of copper. The experiments were made in such a manner that there were produced no secondary compounds capable of changing the atomic proportions of the dissolved salts The influence of masses on the decomposing action of the voltaic current being, therefore, made evident, it was necessary to ascertain if the proportion of the masses, in order to arrive at the division of the current into two equal parts, should not change, when the absolute quantity of the atomic part of the nitrate of silver is increased; that is to say, by increasing it gradually from 0·1g. to 0·5g. and 1g. The results have proved, as might be expected, that the proportion of the masses was no longer the same.

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* *Academy of Sciences*, sitting of the 4th of May: *Comptes Rendus*, No. 18.

By diluting the solutions with water, the influence of the masses is, of course, diminished.

I regret that I am unable to give here the numerous results and the accompanying disquisition, which are given in my Memoir, in order to afford better evidence of the influence of masses on the electro-chemical action of the current, so as to compel it to separate at the same time two equivalents from two different bases. When the quantity of nitrate of copper in the solution is considerable, not only are the above-described effects observed, but there may also be seen in this solution, when it is lighted by the direct rays of the sun, a considerable quantity of small metallic parcels in motion, which seem to indicate, in some measure, the mode in which the particles are transported by the voltaic action.

When the separation of the two equivalents is effected, the power which unites the oxygen and nitric acid to an equivalent of silver, and that which unites the same bodies to an equivalent of copper, being overcome by the same current, must be considered equal; for two equal forces acting simultaneously and in a continued manner, and producing similar effects, are deemed to destroy equal resistances. Hence it cannot but be inferred, that those affinities are equal.

The influence of masses in the present circumstances may be considered thus: in a mixture of two salts, of two metallic nitrates for example, if we increase the number of equivalents of that whose parts are combined by virtue of the strongest affinities, the action of the current on the other nitrate is weakened, so that at a certain time the action of this current is sufficient to overcome the affinities which combine the oxygen and nitric acid to an equivalent of each of the two metals. In what manner does the increase of the masses produce a similar effect? It cannot be conceived that by admitting that, in proportion as nitrate of copper is added to the solution, the particles of this nitrate are again aggregated, which shows increase as much as the action which the current exerts on them. Now, as the action of the current is definite, it follows that that which it exercises on the particles of the other nitrate should diminish in the same proportion, or at least, should be exercised on a smaller quantity.

It would appear, therefore, from the preceding facts, to follow, that the powers which unite oxygen and nitric to an equivalent of silver and to one of copper, are in proportion to the masses necessary to effect a separation of one equivalent from each metal. But is it the simple proportion of the masses? that of their squares, or of another power? Of this we are ignorant: nothing remains but to determine the general law of the atomic proportions which are required in order to obtain the division of the current into two equal parts, when the absolute quantity of one of the elements is uncertain. This determination, which can be arrived at only by many experiments, will assist in finding the general law of the affinities of nitric, or any other acid, for all the oxides. It will then be seen whether the numbers obtained by M. E. Becquerel, in the estimate which he made by means of another process, of the affinities of certain bodies, are the same as those which I shall ultimately obtain.

I may again add, that the facts detailed in my Memoir, present a very simple process for separating two metals from their solution in the same acid. Whenever the proportion of the masses in a given volume of the solution does not admit of separation being obtained immediaiely, it may be effected by diluting it with water to the extent required.

ON CERTAIN FACTS RELATIVE TO THE OXIDIZED COMPOUNDS OF SULPHUR.*

BY PROFESSOR PERSOZ.

In a thesis, which I defended seven years ago before the Faculty of Sciences of Paris, I asserted that certain compound bodies, and especially sulphurous acid, are analogous to cyanogen, and, like it, may perform the function of a simple body by uniting with oxygen, sulphur, chlorine, bromine, and iodine. Setting out with this view, I had an idea of establishing a distinction in the composition of compounds, and I proposed calling the arrangement which exists among the constituent parts of a body, *molecular composition*, abstraction being made of elementary bodies contained in them. Looking at it in this way, I could no longer regard sulphuric acid as a compound formed of sulphur and oxygen, but as a compound of sulphurous acid and oxygen; in a word, I could see in this compound only the elements which contribute to its formation, and which are the same as those into which it is decomposed, namely, 2 vol. sulphurous gas and 1 vol. oxygen. Supposing this way of viewing it to be correct, sulphurous acid having become a radical, should be united with the various simple bodies with which it can combine, in order to form the compounds $\ddot{S} + O$, $\ddot{S}+S$, $\ddot{S}+Cl^2$, $\ddot{S}t+B^2$, $\ddot{S}+ I^2$, in the same manner as 1 eq. of lead or manganese, unite with the same electro-negative bodies, and form the compounds $R\ O+R\ S+R\ Cl^2+R\ B^2+R\ I^2$.

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* Academy of Sciences, sitting of the 6th of April, 1840; from *Comptes Rendus*, No. 14.

From the examination of the combinations of sulphurous acid with oxygen, I was naturally led to study the combinations of this acid with the other metalloids. The difficulties which this study presented were great, but did appear to me insurmountable, and I hoped very soon to obtain results worthy of the attention of chemists, when an unforeseen circumstance* obliged me, contrary to my intention, to communicate my investigations to the Academy before I had completely attained the object which I had proposed.

On causing 8 gr. of sulphur to act on 10 gr. of carbonate of potassa, and on weighing the sulphur found in the various products obtained, M. Vauquelin did not again find the whole of the 8 gr. which he employed. He obtained the following:—

Sulphur obtained in sulphuric acid	0·680
Sulphur combined with hydrogen	1·928
Sulphur obtained from the sulphuret by acetic acid	4·230
Sulphur sublimed during the operation	0·350
	7·183
Loss	817

"What has become," asks M. Vauquelin, "of the 0·817 gr. which are deficient in this analysis? The proportions according to which I have calculated must necessarily be inaccurate, or my experiments must be wanting in precision. However, I have repeated them several times, and always with very nearly the same result."

This remark of M. Vauquelin made me suspect that some product of unknown composition had led him into error. Impressed with this idea, I repeated the preceding experiments. I fused 80 gr. of sulphur with 100 gr. of pure and dry carbonate of potassa: the matter, when cooled, was treated several times by alcohol at 40°. I thus obtained a solution colored deeply by sulphuret of potassa, and afterwards a pulverulent precipitate, which had the apparent characters of sulphate of potassa. The heated solution of this residue may be crystallized by cooling: it precipitates the barytic salts abundantly. This same residue, treated when cold by dilute acids, disengages no sulphurous acid, and does not deposit sulphur; so that, by limiting the study of these characters, it might be considered as sulphate of potassa. However, by heating it in a little tube, it abandons a certain quantity of sulphur: by treating it with ordinary nitric acid, and slightly raising the temperature, there is a decomposition of the nitric acid, accompanied by a deposit of sulphur. The latter characters sufficiently prove that this saline residue has not the composition of sulphate of potassa.

I need not detail the numerous experiments which I have made with the view of ascertaining the nature of this salt; suffice it to say, it is formed by sulpho-sulphuric acid, $\ddot{S}+S$, most of the properties of which are confounded with those of oxy-sulphuric acid, $\ddot{S}+O$. The acid contained in this salt may be liberated, and possesses greater stability than had hitherto been recognised in hypo-sulphurous acid, which has not yet been isolated.

SULPHO-SULPHURIC ACID (HYPO-SULPHUROUS ACID.)

This acid may be obtained easily and in great abundance by decomposing sulpho-sulphate of potassa or soda, with a solution of nitrate or acetate of lead. A double decomposition is effected, from which results an insoluble sulpho-sulphate of lead, which is precipitated. This salt should first be washed several times by decantation, and afterwards on a filter.

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* In its sitting of the 10th of March, 1840, the *Société du Muséum d'Histoire Naturelle de Strasbourg*, received a communication (for which see *The Chemist*, No. V. p. 136) from M. Langlois, in which that chemist announced that he had been enabled to isolate hypo-sulphurous acid, by decomposing bi-hypo-sulphite of potassa with hyperchloric acid. Being informed of this fact, I called upon M. Langlois next day to inform him beforehand, that having myself obtained the same acid several months ago, I intended immediately to submit my results to the Academy. I engaged him also, to do the same, with the view that our respective rights might be properly established.

This attained, the salt is removed from the filter, and sufficient water to make a very thin paste is added: it is stirred, while a current of sulphuretted hydrogen, previously washed, is passed into it. The sulphuretted hydrogen precipitates the lead in the state of sulphuret. The liquor is filtered, and the sulphuret of lead which remains on the filter is washed. The washing waters are mixed with the first liquor; this liquor is immediately rendered turbid by a slight deposit of sulphur: which seems to me to be attributable to the slow action which the sulphuretted hydrogen exerts on the sulpho-sulphuric acid.

Sulpho-sulphuric acid, thus obtained, is diluted with water: to concentrate it, it may be evaporated either *in vacuo*, or in flat-bottomed capsules or porcelain saucers placed on a stove. So long as it does not boil, it is but feebly decomposed, and that occurs only as it approaches its highest point of concentration. At that period heat destroys it, and it is decomposed into its elements, namely, sulphurous acid and sulphur.

I do not exactly know the density of this acid, but I have reason to believe that it is nearly twice that of water.

Sulpho-sulphuric acid is a white liquid; it reddens tincture of turnsole strongly. It decomposes, without heat, the carbonates of potassa, soda, lime, magnesia, and lead: it combines directly with bases, and forms salts (sulpho-sulphates,) which are to the oxy-sulphates what the seleniates are to the sulphates, or, indeed, what the arseniates are to the phosphates. An analogy may be observed, whether we look at the relative solubility of these salts, or at the respective proportions of bases and acids, or those of the salts and water of crystallization. It may be remarked in general, that the sulpho-sulphates are rather more soluble than the corresponding oxy-sulphates.

Sulpho-sulphuric acid, put in contact with easily reduced oxides, can be combined with them only at a moderate temperature; for in the contrary case, there is a destruction of the acid and of the base, and formation of sulphuret (oxide of *silver*).

In contact with the simple bodies or compounds which have a direct action either on sulphur, or on sulphurous gas, and one of the elements of sulpho-sulphuric acid, the latter is always decomposed. Thus, for example, even when it is not very concentrated, it cannot exist even when cold, nor in presence of sulphuric acid; for that acid operates its decomposition when cold, by seizing the sulphurous acid and freeing the sulphur: nor in presence of nitric acid, for there is a mutual decomposition of the sulpho-sulphuric and nitric acids, which is rendered evident by an abundant deposit of sulphur, accompanied with nitrous vapour, which remain dissolved in the excess of nitric acid, and color it green: nor in presence of chlorous (hypo-chlorous acid) or chloric acids, which oxidize the sulphurous acid, and set the sulphur free.

Saline compounds, which are formed, either by acids, or bases of easy reduction, cannot exist in contact with sulpho-sulphuric acid without being decomposed: but sometimes the reaction is performed at the ordinary temperature, and sometimes, on the contrary, it occurs only at an elevated temperature.

By the works of M. Peltier, Sen., we are made acquainted with the mutual alteration which takes place between sulphurous acid and the chlorides of tin. This property is also retained in sulpho-sulphuric acid. The latter, heated with chloride of tin, is decomposed with production of sulphuret of tin. Salts of iron and uranium are reduced to the state of subsalts.

On account of its analogy with oxy-sulphuric acid, sulpho-sulphuric acid exerts a displacing action on the salts, and gives rise to sparingly soluble precipitates in all the saline solutions in which sulphuric acid itself produces a precipitate. It is thus that it precipitates salts of baryta, strontia, and lead, white; those of silver, yellow, turning to brown; the mercurial salts, white or canary yellow. It is also by reason of this analogy that sulpho-sulphuric acid does not render turbid those salts of which the corresponding sulphate is soluble.

The manner in which sulpho-sulphuric acid acts, and its analogy with sulphuric acid, readily give us an idea of the properties of the sulpho-sulphates. These are deduced, when the phenomena of displacing, or indeed, combinations, occur, from all the characters ascertained in the sulphates, and when the phenomena of alteration occur, from the properties we have just noticed as appertaining to sulpho-sulphuric acid.

FACTS RELATIVE TO SULPHO-SULPHURIC ACID AND ITS COMBINATIONS.

BY PROFESSOR PERSOZ.

The author sums up the results of his recent investigation in the following terms:

1st. The various salts designated by the name of *hyposulphite*, must not be compounded with one another.

2d. In the formation of bi-hyposulphites, there are formed several salts, which vary in their properties and composition, and which may sometimes have an oxide for a base, sometimes a sulphuret, and sometimes even a mixture of an oxi-base with a sulpho-base.

3d. Sulpho-sulphuric acid may be obtained in large quantities, by acting on sulphurous acid with sulphuretted hydrogen, under the influence of water.

4th. This acid may likewise be obtained by causing sulphuretted hydrogen to act on sulphuric acid.

ON THE PRESENCE OF IODINE IN COD-OIL.*

BY L. GMELIN.

I formerly announced that I had been unable to detect iodine in two sorts of cod-oil, one of which was of a light color, and the other brown, and I left the question undecided, whether the iodine found by other chemists arose from iodide of soda used in the experiments, or whether certain species of this oil actually contained iodine. The following investigations show that cod-oil evidently contains iodine, and that the kinds which I had first examined were sophisticated.

By treating 60 grammes of pure cod-oil, procured from Bergen in Norway, by Hansmann's method, I obtained, by solution in alcohol, a saline mass, which acted in the following manner: — Its aqeous solution, mixed with starch and dilute sulphuric acid, gave a violet color, which disappeared immediately by the addition of oil of vitriol, and gave place to a yellow color: this solution gave also, with starch and hydrochloric acid, a violet colour, which disappeared on the addition of chlorate of potassa. The experiment was repeated with 750 grammes of the same oil. The phenomena were the same; only, on account of the greater quantity, the coloring of the starch was much more intense, and was not so readily destroyed by oil of vitriol or chlorate of potassa. Carburet of sulphur, stirred with the aqueous solution of the saline mass, to which hydro-chloric or dilute sulphuric acid had been added, was turned of a violet color: part of the dried saline mass was thrown into a mixture of peroxide of manganese and moderately diluted sulphuric acid, which had previously been heated in a glass tube, and violet vapours of iodine were immediately observed to rise, which turned starched paper blue.

These experiments put the presence of iodine in this oil beyond doubt: but it is surprising that the saline mass should give up iodine by the simple addition of hydrochloric or dilute sulphuric acid, which has never been observed with iodide of potassium, as demonstrated in the most positive manner by many counterproofs, in which the blue coloring of starch is produced only by the addition of an oxygenising body, such as oil of vitriol, or chlorate of potassa. It is therefore probable, that the saline mass heated to redness does not contain iodide of potassium, but basic hypo-iodite of potassa. MM. Magnus and Ammermüller and M. Liebig have already directed attention to the hypo-iodite of soda formed by the calcination of basic hypo-iodate of soda, or of a mixture of iodide of sodium and iodate of soda. If a soap of soda be dissolved in water, evaporated and calcined, alcohol removes from it a saline mass, which produces a blue coloration with starch and hydrochloric acid. Although MM. Ammermüller and Magnus observed that in the calcination of basic hyper-iodate of potassa, iodide of potassium alone is obtained, it is not impossible, however, that in the calcination of the soap of cod-oil, where traces of iodide of potassium are disseminated in a great mass of carbonated and caustic potassa, the alkali, acting in excess, disposes the iodide of potassium to absorb oxygen from the air during and after the combustion of part of the carbon, and to form a similar salt in combination with a greater quantity of potassa.

According to my investigations, the following method appears to be the most convenient for detecting iodine in cod-oil, with the least loss of iodine: in a sand bath, 15 grammes of cod-oil are saponified with as much, or rather less, hydrate of potassa, and the necessary quantity of water: when cold, it is filtered in order to separate the aqueous liquid from the very soft soap; it is neutralized almost completely with sulphuric acid; the remaining liquor is evaporated: the residue is calcined: it is boiled in powder with alcohol, and the filtered liquor is evaporated. The saline mass thus obtained, dissolved in a little water is sufficient for three reactions and even more, for example: with starch and oil of vitriol; with starch, hydrochloric acid and chlorate of potassa; with carburet of sulphur and oil of vitriol: hydrochloric acid alone and dilute sulphuric acid do not cause starch to be colored blue with this saline mass, because it contains iodine under the form of iodide of potassium.†

The iodine contained in cod-oil being, at

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* *Journal de Pharmacie*, April, 1840.

† These experiments have been successfully repeated on cod-oil procured in Paris. By saponifying with hydrate of potassa on the open fire, which renders the operation more rapid, the violet coloration of the starch was effected, even with dilute sulphuric acid.

In conclusion I may observe, that, according to the evidence of M. J. Tiedemann, a merchant at Bremen, who possesses great knowledge concerning this article, there are in commerce three sorts of cod-oil. Indeed, the oil is procured by exposing the liver of the cod (*Gadus Callarias*, Linn.) to the sun, in casks placed upright, and furnished with three bungholes one above another. When the uppermost bung is removed, we have the clearest oil, which is the fittest for medical use. The middle and lower bungs are afterwards withdrawn, and a brown oil is obtained. The residue, expressed with heat, yields a very dark brown and thick oil, which is used by leather-dressers.

ON THE IODIDES OF MERCURY.*

BY M. SOUVILLE.

The author commences the chemical study of the iodides of mercury, after giving the reasons which led him to choose this subject, and which were deduced from the importance that the compounds with which he is engaged have acquired in therapeutics owing to the works of MM. Biett, Ricord, and Gibert, and the more recent ones of Dr. Puche.

Setting aside all that has already been said on this subject, we here relate only the new and very interesting observations which are to be met with in this Memoir. In M. Souville's opinion the action of nitric and sulphuric acids on prot-iodide of mercury has not been studied with sufficient care: when cold, these acids, concentrated or diluted, are without action on the iodide; but when warm, the latter is decomposed, half of the mercury which it contains is oxidized by part of the nitric or sulphuric acid, which is itself decomposed; there results on one hand deut-iodide, and on the other, deut-oxide of mercury which combines with the undecomposed acid and forms nitrate or sulphate of the binoxide, which combines with the deut-iodide, whence result peculiar salts. Somewhat similar phenomena are produced by the action of nitric and sulphuric acids on deut-iodide of mercury: when cold, these acids, however concentrated they may be, are incapable of altering it, but with heat the action is very vivid; there occurs with nitric acid a disengagement of reddish vapours mixed with vapours of iodine, half the deut-iodide is decomposed, the iodine is volatilized while the mercury is oxidized by the nitric acid, and forms a nitrate which afterwards combines with the undecomposed deut-iodide forming the same salt as was obtained by the action of nitric acid on the prot-iodide of mercury; with sulphuric acid, there is also a decomposition of half the deut-iodide, disengagement of sulphurous acid and vapours of iodine, and production of sulphate of binoxide of mercury, which combines with the undecomposed deut-iodide, and forms with it a crystallizable salt.

The author observes that the crystallization of deut-iodide of mercury is very variable: thus, bracteæ of various forms may be obtained by crystallizing this salt in a solution of acid nitrate of mercury or iodide of potassium; sometimes by availing ourselves of the latter vehicle, we obtain prismatic crystals which are formed of a series of octohedra inserted into one another.

The deut-iodide of mercury, in combining with the alkaline iodides and some chlorides, acts the part of an acid with relation to these compounds. It combines, also, with hydrochloric and hydriodic acids, and the nitrates and sulphates of binoxide of mercury. M. Souville admits that, in this case, it acts the part of a base; consequently he divides the consideration of the saline combinations of deut-iodide of mercury into two sections: the first comprising the salts which have iodide of mercury for their electro-negative element, and the second, those in which it acts as a base, or electro-positive element. We commence with the second.

DOUBLE NITRATE OF BINOXIDE AND BINIODIDE OF MERCURY.

This is a new salt, discovered by M. Souville: it is produced by the action of nitric acid on prot-iodide or deut-iodide of mercury. This salt is in white, pearly crystals, which are formed only in concentrated nitric acid. Water decomposes it, and separates from it deut-iodide of mercury which is precipitated with a certain quantity of subnitrate; the liquid contains acid nitrate of mercury and a small quantity of deut-iodide. This salt is anhydrous and decomposable by heat: the deut-iodide separates from the nitrate which is decomposed. Analysis has given as its composition, one atom of nitrate of binoxide of mercury and one atom of deut-iodide. It is prepared by boiling an excess of concentrated nitric acid with prot-iodide of mercury: it is filtered and left to cool; crystals are then deposited.

DOUBLE SULPHATE OF BINOXIDE AND BINIODIDE OF MERCURY.

This salt is completely analogous to the preceding, and, like it, decomposable by water and heat: it crystallizes only in con-

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least as we have every reason to believe, the essential cause of its medicinal properties, apothecaries should not use this oil until they have tested it.

* *Journal des Connaissances Medicales*, April, 1840.

centrated sulphuric acid. It was found to be formed of one atom of sulphate of binoxide of mercury, and one atom of biniodide of mercury: it is prepared by heating concentrated sulphuric acid with prot-iodide of mercury; it is decanted and left to cool; crystals are immediately formed; they are separated by decantation, and afterwards washed with alcohol at 40°.

M. Souville considers these compounds as sub-salts, in which an atom of binoxide of mercury is replaced by an atom of deut-iodide of the same metal; he remarks that this kind of compound, although very rare in chemistry has, however, sometimes been observed: thus M. Wöhler has made known a crystalline combination of nitrate of silver and cyanide of mercury.

The compounds in which deut-iodide of mercury acts as an acid were discovered by MM. P. Boullay and De Bonsdorf. They are called iodhydrargyrates.

M. De Bonsdorf, having observed that deut-iodide of mercury was dissolved in a solution of iodide of potassium in proportions varying with the quantity of water employed, and the elevation or depression of the temperature, concluded that there did not exist definite combinations between the iodides of mercury and potassium. M. Boullay, on his part, admitted that they formed true salts in definite proportions; namely, the prot-iodhydrargyrate, containing one atom of each element; the deut-iodhydrargyrate, containing two atoms of red iodide and an alkaline iodide; and the trit-iodhydrargyrate, containing two atoms of the first and one of the second.

M. Souville shows that of these three salts there exists but one, crystallized deut-iodhydrargyrate, which is decomposed by water, but is readily dissolved in a solution of iodide of potassium.

In heating a solution of cyanide of potassium with deut-iodide of mercury, M. Souville observed, that there was a double decomposition, and that bicyanide of mercury and iodide of potassium were formed, which combined together and caused the formation of beautiful white pearly needles. This combination had already been formed by M. Caillot; but it had not been analysed: M. Souville ascertained that it was formed of two atoms of bicyanide of mercury, and one atom of iodide of potassium without water: he has given it the name of bi-cyanhydrargyrate of iodide of potassium.

Deut-iodide of mercury, by the intermedium of water and heat, decomposes the yellow cyanide of potassium and iron, first precipitating from it the protocyanide of iron, and afterwards reacting on the cyanide of potassium, as if the latter were entirely insulated: bi-cyanhydrargyrate is then formed. Finally, M. Souville, after having pointed out, in a succint manner, the benefits which medicine has derived from these compounds, mentions some new formulæ of Dr. Puche, who has used, with much success, iodhydrargyrate of iodide of potassium: it may be useful to give these formulæ here.

POMMADE OF IODHYDRARGYRATE OF POTASSIUM.

Hog's lard . .	30·00 grammes.
Deut-iodide of mercury	0·50 centigrammes.
Iodide of potassium .	0·50 centigrammes.

SOLUTION OF IODHYDRARGYRATE CORRESPONDING TO VAN SWIETEN'S LIQUOR.

Distilled water . .	25·000 grammes.
Deut-iodide of mercury	0·025 milligrammes.
Iodide of potassium	0·025 milligrammes.

In pills, the iodhydrargyrate is administered in doses of from two to ten centigrammes.

This medicine has the advantage of being very active, and of not producing salivation so promptly as other mercurial preparations.

ON THE IODIDE OF CINNAMYLE.*

BY M. DESPAN.

My attention having been frequently attracted by the turbid appearance of a draught, containing distilled cinnamon water, iodide of potassium and iodine, I made some investigations to ascertain the cause of this phenomenon, and I was fortunate enough to obtain the body which I now present to the *Société de Pharmacie.*

The proportions which have appeared to me best adapted to its formation are:—

Iodide of potassium . .	2·60
Iodine	0·10
Distilled cinnamon water .	180·00

Iodide of potassium and iodine are first dissolved in distilled water; this solution is afterwards mixed with cinnamon water: the mixture immediately becomes of a yellowish red color: there are soon perceived on its surface a multitude of small shining needles, of a golden yellow color and metallic lustre: at the end of twelve hours, these crystals are deposited at the bottom of the vessel and may be collected on a filter and dried in a moderately heated stove.

When dried, these crystals preserve the same appearance, namely, the form of very fine needles, the golden yellow color and the metallic lustre. Their taste is sweet, and they have the smell of cinnamon.

A small quantity of this compound, rubbed with the nail on paper, forms on it a thin layer exhibiting the metallic lustre of a sheet of gold.

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* *Journal de Pharmacie*, April, 1840.

A few crystals exposed to the air on a sheet of paper in a place, the temperature of which was about 10 C., were entirely volatilised at the expiration of twenty-four hours, without leaving any trace on the paper.

These crystals melt at a moderate temperature, and the heat of the hand alone is sufficient to produce this phenomenon: by cooling, the liquid is again crystallised.

Heated more powerfully and with the contact of air, they melt, and are then gradually dissipated, at first giving out the smell of essence of cinnamon, afterwards, towards the end, a perceptible smell of iodine, and at the same time violet vapours appear.

A certain quantity of these crystals heated on a sheet of platinum, burned vividly, with a yellowish white flame, and left a little carbonaceous layer, which disappeared without leaving any residue.

Introduced into a small retort which was placed on a sand-bath slowly and gradually heated, they entered into fusion, and the interior of the retort was filled with reddish brown vapours, which condensed in the upper part in small blackish red drops. When the temperature increases, violet vapours appear, an oleaginous liquid of a very deep red color condenses in the neck of the retort, and flows into the receiver: this liquor always has the smell of cinnamon and a sweet taste; it burns like the essential oils, and does not seem to be crystallizable. There remains at the bottom a small quantity of carbon.

Treated by distilled water, these crystals appeared to me to be dissolved only after having undergone decomposition: at any rate, if a small quantity of it be triturated in a mortar, and if water be poured in by small portions, they are liquefied, acquire a deep red color, and give rise to small drops of an oily appearance exhaling the smell of iodine.

This compound is soluble in alcohol, and especially in ether. The latter solution, abandoned to spontaneous evaporation, leaves an abundant crystalline layer at the bottom of the vessel.

Such are the properties which I have observed in this substance: my occupations not permitting me, for a time, to study them more profoundly, I thought, nevertheless, that these first results might be of some interest, and I determined, therefore, to present them, until circumstances permit me to make a more extended examination of them.

The nature of the substances which cause the formation of this body, and the circumstances under which it is formed, cause it to be regarded as analogous to iodide of benzoyle, and as constituting an iodide of cinnamyle: but elementary analysis alone can set this question at rest.

ON THE ESSENCES OF TARRAGON AND SAVINE; ON CINNHYDRAMIDE, AND ON BROMIDE OF CAMPHOR.*

BY M. LANNENT.

Essence of tarragon boils at 206°. Its density $=0{\cdot}945$.

The density of the vapour $=6{\cdot}157$.

Its formula is $C^{48}\,H^{32}\,O^{2}$: it represents 4 volumes of vapour.

It may be combined with sulphuric acid, forming an acid which I call sulpho-draconic.

The formula of sulpho-draconate of baryta is $C^{48}\,H^{32}\,O^{2}, SO^{3} + Ba\,O$.

This essence yields, with nitric acid, five new crystallizable acids.

The essence of savine has the same composition and properties as essence of turpentine.

Cinnhydramide is a crystallized substance which I obtained with ammonia and essence of cinnamon: its formula is $C^{36}\,H^{18}\,Az^{\overset{4}{3}}O$.

The law of substitutions is here at fault; for the essence of cinnamon has lost one equivalent of oxygen, and has gained three equivalents of hydrogen and azote.

It may take place by means of the following reaction:—

$(C^{36}H^{14}O^{2}+H^{2})+H^{4}Az^{\overset{4}{3}}=(C^{36}H^{14}Az^{\overset{4}{3}}+H^{2}+H^{2}O)+H^{2}O$, which is disengaged.

Bromide of camphor is a crystallized body, which is formed by mixing bromine and camphor. Its formula is $C^{40}\,H^{32}\,O^{2}+Br^{4}$.

Its properties are such, that we can look upon it only as a bromide, for, on exposure to the air, it liquifies almost immediately; bromine is disengaged, and the camphor remains.

Ammonia converts it immediately into camphor.

Distillation likewise transforms bromide of camphor into bromine and camphor; but, at the same time, a little hydro-bromic acid is disengaged, and a small quantity of an oily matter, containing bromine, is formed. The latter should be the result of the following reaction:—

$C^{40}\,H^{32}\,O^{2}+Br^{4}=C^{40}\,H^{30}\,Br^{2}\,O^{2}+H^{2}\,Br^{2}$, which is disengaged.

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† *Comptes Rendus*, No. 13, March 30, 1840.

ON THE REDUCTION OF PLATINUM FROM THE CHLORIDE OF PLATINIUM AND POTASSA.

BY VICTOR PARISOT.

It is well known that chloride of platinum is employed in laboratories, for detecting the presence of potassa, or its salts, in various liquids. Being consulted as to the readiest means of extracting the platinum contained in these residues arising from these experiments, I performed some experiments, the results of which are here communicated.

The process which I employed and which succeeded, is based on the property which zinc possesses of precipitating metals when it is put into contact with their acid solutions.

This process consists in taking the precipitate of chloride of platinum, or the liquid which holds it in solution; in diluting it with water in order that solution may be complete; and in saturating this liquid with sulphuric acid, added in excess. If the liquid, as sometimes occurs, contain any carbonates, the acid must be added with caution, in order not to lose a portion of the product, which might take place, if effervescence were too rapid.

The liquid being acid, a bar of zinc is plunged into it: it is then observed that there is a decomposition of the water, disengagement of hydrogen and formation of sulphate of zinc which remains in solution, while the platinum is precipitated under the form of a black powder.

The reaction and the disengagement of hydrogen may be maintained by adding a little acid, and that until the platinum is precipitated; which is easily ascertained by the liquor being completely decolored.

When the platinum is reduced it is collected on a filter: it is washed in boiling water, and allowed to dry, and, in order to deprive it of any small quantity of metal which it might retain, it is treated by hydrochloric acid and heat, washed in boiling water; and afterwards treated by hydrochloro-nitric acid in order to obtain chloride of platinum, which may be used in other experiments.

ANALYSIS OF THE LEAVES OF THE DIGITALIS AMBIGUA.*

BY M. SCHLESINGER.

According to this chemist, 100 parts of these leaves dried are composed of:—

Chlorophylle, in two different modifications	12·67
Resin	11·39
Extractive matter and sulphate of lime	8·56
Coloring matter	22·86
Gum, with chloride of sodium and sulphate of lime	14·90
Phosphate of magnesia	2·91
Albumen	12·67
Fibre	14·04
	100·00

The recent leaves contain 81·5 of water.

122 gr. gave 17 decigr. of ashes, composed, in grains, of

Phosphate of magnesia	3·493
Sulphate of lime	10·259
Carbonate of lime	6·273
Chloride of sodium	7·561
Silica	4·250
	31·836

CHEMICAL EXAMINATION OF THE LIQUOR AMNII OF A WOMAN IN THE FIFTH MONTH OF PREGNANCY.†

BY J. L. LASSAIGNE.

Last summer, Dr. Donné sent me, for examination, the liquor amnii extracted from the amnion of a young woman who died in the fifth month of her pregnancy.

It was colorless and inodorous, had a slight alkaline reaction on test papers, and was rendered rather milky and turbid by white, viscous, insoluble flakes, formed of mucus and fatty matter. Its density, taken at the temperature of + 17 centig., was about 1·009.

Evaporated to dryness in a porcelain capsule, it left a saline residue whose weight formed $\frac{115}{10000}$ of the whole mass of liquid.

The different experiments to which this liquor was submitted, lead me to consider it as formed, in the hundred parts, of—

Water	98·85
Organic matter Albumen, uncrystallizable extractive matter, analogous to osmazome.	00·60
Inorganic matter Chloride of sodium, chloride of potassium, carbonate of soda, traces of phosphate and sulphate of soda, traces of phosphate of lime.	00·55
	100·00

The fatty matter whose presence in the insoluble viscous flakes was remarked, was but partially saponified by a solution of caustic potassa. The small quantity of it which I had extracted, did not allow me to study it in such a manner as to establish its distinctive characters.

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* *Pharm. centrablatt.*

† *Journal de Chimie Médicale*, April 1840.

ANALYSIS OF TWO ARTHRITIC CONCRETIONS.[*]

BY MM. PAUQUY AND BOR.

These concretions were formed:—

1st. Of urate of soda;

2nd. Of urate of lime;

3rd. Of an albuminous animal matter.

They contained neither phosphate nor chloride of sodium; they were almost completely soluble, except one part, of a membranous appearance, which remained undissolved; and the authors conclude that an alkaline liquid administered internally might, in certain cases, prevent the formation of these concretions, or at least relieve those afflicted with them.

MODE OF ESSAYING QUINQUINA.[†]

The different proportions of alkaloids contained in quinquina induce us to publish the following mode of essaying it, which was communicated to us by M.M. Thibon-Méry, who has practised it repeatedly.

One kilogramme of quinquina is reduced to powder, and treated by ten quarts of alcohol acidulated with 16 grammes of sulphuric acid at 66°: it is distilled to half, namely, to five quarts, decanted, strained with pressure, and subjected to a fresh treatment with the same quantities of alcohol and acid; the liquors are mixed, and 64 grammes of quicklime, in powder, and 64 grammes of fine animal charcoal, of good quality, are added; the whole is distilled until there remains only five quarts of liquid in the cucurbit; it is filtered and distilled *de novo* in a sandbath, in order to separate the alcohol from the quinine, which remains in the retort.[‡] This quinine, dissolved with a slight excess of dilute sulphuric acid, treated by 16 grammes of animal charcoal, yields a liquor which, filtered, gives white sulphate of quinine, whose quantity represents the commercial value of the quinquina.

The essaying of some quinquinas is so much the more necessary, as, according to the view given by M. C. H. Plaff, in his memoir printed in the monography of Berghem concerning the quantities, these barks furnish the following proportions in 1000 grammes:—

	Cinchonine.	Sulphate of Quinine.
Huanuco, called Lima . .	36·46	,, ,,
Pitaya (Guibourt) . . .	23·11	11·52
Red	31·94	1.56
Royal yellow, called Calysaya	,, ,,	28·00
Huamaties, called Havannah	16·50	,, ,,
Yellow Carthagena . . .	5·90	5·21
Loxa	,, ,,	9·25

It is evident, according to these results, that the Huanuco, called *Lima*, contained 36.46 vegetable alkaloid; the Pitaya, 34·52:[§] and the red, 33·50; the yellow royal, or Calysaya, 28·00; the Huamaties, or Havannah, 16·50; the yellow Carthagena, 11·11; the Loxa, 9·25.

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[*] *Journal des Connaissances Médicales.*

[†] *Journal de Chimie Médicale*, April, 1840.

[‡] The apparatus should be varied according to the quantities of quinquina to be treated.

[§] This is incorrect; it should be 34·63.—SUB.-ED.

II. CHEMICAL MANUFACTURES.

NEW WRITING FLUID.

To the Editor of the Chemist.

Wraxall, near Bristol, April 28, 1840.

MY DEAR SIR,—A good durable writing fluid, which will remain unaffected by moisture, acids, alkalies, and even by chlorine, to the extent to which paper or parchment can resist these destructive agents, and also capable of flowing as freely from the pen over the most unctuous surfaces, as over a surface absolutely free from grease, cannot but be a desideratum to those whose pursuits engage them much in the laboratory, and whose memoranda (frequently made in the midst of acrid vapours) are often required to be of a permanent nature.

A fluid embracing all the desiderata here mentioned I have prepared in the following manner, and I have much pleasure in making it known to my scientific brethren.

℞ Shell Lac	2 ounces.
Borax	1 ounce.
Distilled, or rain water..	18 ounces.

Boil the whole in a closely covered tin vessel, stirring it occasionally with a glass rod, or a small stick, until the mixture has become homogeneous. Filter, when cold, through a single sheet of blotting-paper.

Mix the filtered solution (which will be about 19 fluid ounces) with one ounce of mucilage of gum acacia (prepared by dissolving one ounce of gum in two ounces of water), and add pulverised indigo and lamp black *ad libitum*. Boil the whole again in the covered vessel, and stir the fluid well to effect the complete solution and admixture of the mucilage of gum acacia. Stir it occasionally while it is cooling; and after it has remained undisturbed for about two or three hours, that the excess of indigo and lamp black may subside, bottle it for use.

As much of the coloring matter will even then be held in suspension, it will be prudent to agitate the bottle that contains this ink, previous to its employment.

There is scarcely a chemical reagent which will not instantly decompose this ink while in a fluid state: hence it should always be used with a clean pen; but when it has once become dry (and it dries with as much facility as any of the ordinary inks) it will resist the long continued action of water, spirit of turpentine, alcohol, diluted sulphuric acid, diluted hydrochloric acid, oxalic acid, chlorine, and solution of caustic potassa. These, being sufficiently severe tests, are the only menstrua which I have considered it necessary to employ. I enclose a few specimens of the action of these "destructives" upon the fluid described, contrasting its power of resisting their influence with that of six varieties of very generally adopted inks prepared by celebrated manufacturers. The lines upon each specimen are numbered 1, 2, 3, 4, 5, 6, and 7, and on the reverse side of each specimen is written the name of the menstruum employed.

No. 1 is my Laboratory Ink.

No. 2 is Perry's Ink.

No. 3 is Stephens's Blue Writing Fluid.

No. 4 is Webster's Manganese Ink.

No. 5 is Hathway's Superior Ink.

No. 6 is Walkden's Extra Ink, prepared by Messrs. Terry & Co.

No. 7 is Walkden's Japan Ink, prepared by ditto.

I have forwarded to the Secretary of the "Society for the Encouragement of Arts, &c.," a copy of the formula for the preparation of this writing fluid, and likewise a series of specimens similar to that which I have enclosed for you.

This fluid is admirably adapted for writing upon parchment, and it ought to supersede every other ink for all important documents. This communication is written with the fluid in question. Your readers will probably feel obliged by your opinion as to its merits.

I have lately been informed that the Hindoos prepare an ink somewhat similar in composition to the writing fluid which I have described; but I cannot obtain any specific formula for its preparation to enable me to compare the respective qualifications of each.

The expense of preparing the fluid herein described will be about one shilling for forty fluid ounces.

I remain, dear Sir,
Yours very truly,
CHAS. THORNTON COATHUPE.

P.S. Of course I do not invite your attention to the color of this ink, as you know that it may be either very black, blue, or otherwise, depending entirely upon the quantity of the coloring ingredients which any person who may make it for himself may think fit to include in the bottles which he sets aside for his own use. It will not be more permanent for being darker, nor will it flow so freely from the pen, if allowed to be very black.

C. T. C.

[We made many trials of the writing fluid composed according to Mr. Coathupe's formula, and are fully satisfied of its complete adaptation to the various purposes for which it is recommended. It perfectly withstands all the tests enumerated in the description, and we feel confident that it will be found a valuable substitute for the various kinds of ink made with sulphate of iron and other metallic preparations. We can also testify to its superiority in all the other respects mentioned by Mr. Coathupe at the commencement of his letter.—ED.]

ON THE ADULTERATION OF PORTER.

BY CHARLES WATT.

Of all the adulterations practised by retailers in the commodities of life, none are so frequent or injurious to health as those of excisable articles, and more especially of porter, the common beverage of the people.

That this is a serious evil to public health, to the brewer and to the revenue, must be apparent to every one who considers that porter is consumed in vast quantities by the lower classes, and that it forms an article of extensive commerce.

Such is the extent to which adulterations and frauds in this article are carried by the retail dealers, that to get porter genuine as sent out by the brewers, is almost impossible. Such too is the difficulty of detecting the fraud, and punishing those committing it, that the case is abandoned as hopeless, and the imposition submitted to by the public and the excise, as one beyond their power to remedy.

Every effort has indeed been made, both by the excise and the brewer, to detect the guilty; gross cases have been publicly exposed, and suitable examples have been made, by the infliction of fines. Compared, however, with the extent of the evil, those examples are so few as to afford little or no protection to the public; having taken place only where long continuance in adulteration had made the parties so careless as to become suspected, to be informed against, and to be subsequently discovered by the officers even in the fraudulent act.

The danger of such detection, however, is easily avoided by their, from time to time, performing the operation in the cellar upon the beer, when required to be drawn; and it is well known that, thus secure, this fraud is carried on with such recklessness and impunity, that the publicans, and especially the proprietors of those dens of drunkards called gin-palaces, make at least three butts of porter out of two.

For this purpose, they mix up with it compounds of treacle and water, Spanish liquorice, sugar and water, sulphate of iron, salt, and infusions of various substances, such as gentian root, &c. But these are harmless, and even beneficial, compared with the decoction of cocculus indicus, strychnia, and even tobacco-water,—employed to deceive the taste and counterfeit the properties of the genuine beer.

The excise and brewers have employed chemists, with a view to obtain certain tests by which to discover these impositions; but with no certain success. In fact, such discovery is impossible; as the substances with which beer is mostly adulterated, cannot be subjected to this kind of analysis. Still, however, the imposition is too injurious to be suffered to go on without a check; more especially as the method I am about to describe may, with the joint co-operation of the excise and the brewers, put a stop to it.

In the numerous experiments I have made with porter from public houses, with the exception of the filth put in to deceive the palate, &c., the principal point demanding attention is the quantity of water employed to increase the profit of the publican. This I have found to be quite equal to one-third of the beer as it is delivered by the brewer.

This point established, (and I shall soon show that it is so beyond all question,) the fraud on the brewer, the revenue, and the public, is at once made evident; in so far as it is beer containing a given quantity of vinous spirit which is furnished by the brewer,—whose proportion of ingredients and water are always the same, yielding an article of uniform strength, and paying a corresponding duty to the revenue,—and which the public has a right to expect from the hands of the retailer. It is therefore quite clear that any reduction of spirit by dilution is a fraud upon all these parties.

I may now describe the means I adopted to detect the precise amount of adulteration, in this respect, of the beer kept by publicans, as compared with that made and sent out by the brewers.

I took a pint of genuine porter from each of different brewers, and put it into a small still heated by a spirit lamp; and, after distilling over all the spirit, and then subjecting it to a second rectification, I found it to contain about two ounces, or two ounces and a half, of spirit somewhere about proof; but I was not exact in this, as it is not of much moment, and for practical purposes can be more minutely conducted. In the porter taken from different breweries I found not much deviation in this respect, and I therefore assume the quantity of spirit I have named as about the average quantity in good and genuine porter.

My next step was, of course, to subject a pint of porter procured from various public houses to the same process of distillation, and after careful rectification, to note the quantity of spirit; and here I found a diminution of spirit of from half a fluid ounce to an ounce, and sometimes even more.* These experiments, which were often repeated, satisfied my mind, as they must those of all who consider the subject, that with the publican alone lies the disgrace of this fraudulent practice.

The other nauseous materials put in to give *flavour* and deceive the taste, may, after the distillation, be subjected more easily to analysis, if judged proper; but I would here observe, that it is a somewhat nice and difficult operation, as they are generally inert, and what may be called merely nauseous substances, though they are too often injurious and even poisonous.

From the preceding facts, it will at once be evident, that a remedy against this fraud is at hand, both for the revenue and the public; and I would suggest the following method of proceeding to detect and punish those who violate the laws in this respect.

Let the officers go to the publicans in their district, and procure a given quantity, not less than a pint, of porter, at such house or houses as they may suspect or be informed of; then let some competent person perform the distillation according to the method and with the care I have advised; and subsequently let him repeat the operation upon the same quantity of genuine porter procured from the brewer who supplies the publican from whom the suspected sample was obtained; and finally, by noting the different quantities of alcohol yielded by each sample, he will arrive at the fact of adulteration; for if the one affords less alcohol than the other, it must have been diluted with water.

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* It is a singular fact, that few think of judging of porter by its strength or body, whereas they immediately detect and complain of any defect in this respect in ale; and therefore it cannot be so easily diluted.

The next step after the distillation is to evaporate the remaining spent beer from each sample—the publican's and the genuine, which will better enable the operator to ascertain the fact of the former containing any, and what kind of, extraneous and injurious ingredients, by comparison and other means; for although such ingredients as treacle and water, or sugar and water, cannot be detected, some of the more deleterious ones, if the experiment be carefully conducted, may be rendered evident by such tests as the case may indicate. If this plan be strictly carried out, an entire stop will at once be put to this long-continued fraud.

We here, by no means, intend to offer any opinion upon the effects of porter or other fermented liquors upon the human constitution; we know the mischief produced by alcohol in every shape; but so long as these liquors continue to be the common beverages of the country, it is of importance that they should be supplied to the public in a genuine form, free from nauseous and poisonous admixtures, and that, at the same time, the revenue and the brewer should be protected in their duties and profits. Wherever, therefore, it is in our power to aid in the detection or suppression of this or any other frauds injurious to the health of the community, no considerations shall induce us to relinquish our purpose.

CHEMICAL INVESTIGATIONS CONCERNING DYEING. — ON THE IMMEDIATE COMPOSITION OF WOOL.—ON THE THEORY OF SCOURING IT; AND ON CERTAIN PROPERTIES DERIVED FROM ITS IMMEDIATE COMPOSITION, WHICH EXERT AN INFLUENCE IN DYEING IT.*

BY M. CHEVREUL.

Wool has hitherto been but little studied with respect to those of its properties which influence the success of the operations it undergoes in dyeing. On account of this deficiency, it has been impossible to foresee the inconveniencies to which the presence of certain bodies, accidentally mixed with it, or added by design, might give rise. For the same reason also, it has not been possible to give an exact account, still less to recognise the cause of the inequalities manifested in the color of wool, whether spun or woven, which the dyer wishes to dye in an uniform manner. I therefore considered it my duty to pay very particular attention to a detailed examination of wool: for its immediate composition certainly is more complex than that of any other stuff: consequently, it is necessary to determine the influence which its immediate principles exert in a given case, and which, according to a paper I read to the Academy of Sciences in 1828, are, at least, three in number, in wool cleansed by distilled water, namely:—

1st. A fatty substance, solid at the ordinary temperature, and perfectly liquid at 60° C.

2d. A fatty substance, liquid at 15° C.

3d. A filamentous substance, constituting wool, properly so called.

I have said that wool contains at least three immediate principles, because, according to my observations, the filamentous substance disengages sulphur, or hydrosulphuric acid, without losing its characteristic and essential properties; whence it appeared to me probable that the sulphur entered as an element into the composition of a body perfectly distinct from the filamentous substance, properly so called. To demonstrate the correctness of this opinion, and the conclusions to be deduced from it, as regards both chemical manufactures and physiology, is one of the principal objects of this Memoir. But before doing so, it may be as well to explain some of the chemical properties of wool in the state in which it is employed.

1. ON CERTAIN PROPERTIES OF CLEANSED WOOL.

1000 parts of wool, well cleansed from foreign matters, and subjected to the mechanical processes of division and ventilation, yield from 5 to 3 of ashes, generally formed of the phosphates of lime and magnesia, of sulphate of lime, of lime, of peroxide of iron, of silica, and sometimes of peroxide of manganese.

Wool, treated by hydrochloric acid, leaves only from 0·002 to 0·001 of ashes.

Wool, exposed for two hours to 150°, assumes a yellow color, which acquires more intensity, if the temperature be raised to 170°.

Wool, when heated to dryness at 100°, does not disengage either ammonia or any sulphurous emanation: at 130°, it yields ammonia, and from 146° to 150°, a sulphurous emanation, without any perceptible disengagement of gas insoluble in water.

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* *Academy of Sciences*, Sitting of the 20th of April, 1840.

Water favours the development of the sulphurous vapour; for it is sufficient, to recognise it in the vapour which is disengaged, to boil the wool in water. Water containing sulphuric acid, and especially alum, acts less than distilled water.

From the tendency of wool to yield sulphur, it is not surprising that it blackens, especially with heat, by contact with certain metallic bodies, such as the acetates of lead, the proto-chloride of tin, &c.

I may here mention some very singular observations concerning the influence of the contact of certain bodies with wool during the space of four years.

1st. 1 part of wool, steeped in 40 parts of water holding in solution 0·4 of hydrated sub-carbonate of soda, and 0·4 of tin foil being disseminated among its filaments, caused a disengagement of hydro-sulphuric acid and ammonia, and a formation of proto-sulphuret of tin: the wool was very materially altered in its tenacity, and there was formed, at the expense of its elements, a very considerable quantity of a volatile, odorous acid, of which I shall speak farther on.

2nd. 1 part of wool, treated like the preceding, with the exception that lead was substituted for tin, was of a deeper color, but less altered in tenacity: it likewise produced less of the volatile, odorous acid.

3rd. 1 part of wool, treated as above, protoxide of lead being substituted for lead, was colored much more, and was evidently more altered.

It is evident, therefore: 1st, that the contact of tin with wool, in slightly alkaline water, causes a much greater alteration than metallic lead: 2ndly, that the contact of protoxide of lead with the alkalized water caused a greater alteration than did metallic lead in similar circumstances.

I may add that if 1 part of wool be kept in 40 parts of water with 0·4 of protoxide of lead without alkali, it is colored, if not deeper than with it, at least, more uniformly: but it is a remarkable fact, that the tenacity of the wool is scarcely altered, whilst, if there had not been protoxide of lead with the distilled water, it would have lost much of its tenacity.

Another remarkable fact is, that wool left for four years in distilled water, presented nothing at the end of that time, which would indicate a separation of its sulphur, except a slight alliaceous smell· but lead paper suspended in the atmosphere of the flask which exhaled this odour, retained its whiteness. It lost some of its tenacity, but less, however, than the portion which had been in contact with the tin and sub-carbonate of soda. Carbonic acid and ammonia were produced.

The action of protoxide of lead in preserving wool is completely analogons to that which I recognised in magnesia, of preserving pork fat from rancidity.

The altering action of tin in alkalized water may easily be explained.

In treating wool by nitric acid, and by using every possible caution for determining accurately, by means of chloride of barium, the quantity of sulphuric acid produced by the sulphur which it contains, I found 1·78 of sulphur in 100 parts of wool, in the state in which it is used.

II. OF THE FATTY MATTER OF WOOL, AND OF THE THEORY OF FREEING WOOL FROM GREASE.

I will now proceed to detail briefly the experiments which I made, in order to come at the explanation of the cleansing of wool from grease. This operation, carried on in the large way, consists principally in treating, at a temperature of 60° to 73° in general, greasy wool, and, indeed, all the varieties of wool occurring in commerce, by water rendered alkaline by means of ammoniacal urine, sub-carbonate of soda, or soap, to which is often added, an argilo-calcareous milk. After 10, 15, or more minutes, the wool is washed quickly in baskets, or copper vessels perforated with holes, plunged in a stream of water.

I treated by cold distilled water, a kilogramme of merino wool, in the greasy state, until it imparted nothing more to that liquid. The water with which it was first washed was colored, because it had dissolved the foreign matters, and it was turbid because it had withdrawn most of the earthy matter which greasy wool always contains.

Every one is aware that M. Vauquelin considers the grease as a soap of potassa.

Wool washed with cold distilled water until nothing more could be removed from it, had a reddish grey color; it was not very easily wetted. It was evidently greasy to the touch: when pressed between two double Swedish papers with a hot iron, it stained them very much; and the stains did not disappear in the air, because they were produced by a fatty matter which was not evaporable.

The fatty matter, which I separated from wool by means of boiling alcohol, is composed of two immediate principles, corresponding, as regards the difference of their fluidity, to stearine and oleine. It is for that reason that I call them stearerine (the hard fat of wool), and elaierine (oil of wool); but they are absolutely different from stearine and oleine in many of their properties, and especially in that of not being saponified by the alkalies.

Stearerine is perfectly liquid only at 60°, whilst elaierine remains so at 15°.

Both are neutral to colored reagents.

1000 parts of alcohol (density 0·805,) dissolved at 15°, only one part of stearerine and 7 of elaierine. The process, by means of which these two principles are separated from one another, is founded on this difference of solubility.

One part of stearerine and 100 parts of water, heated together, do not make an emulsion, even after cooling, as do the same quantities of elaierine and water.

One part of stearerine and two parts of hydrate of potassa, dissolved in water, and heated to 97° or 99° C. for the space of 60 hours, form an emulsion, but are not saponified.

By distilling stearerine and elaierine with hydrate of potassa, neither ammonia nor sulphur is obtained. They seem, therefore, to be void of azote and sulphur, and to be formed only of carbon, hydrogen, and probably oxygen, united in proportions which I will give hereafter.

If we seek the proportions of fatty matter in wool which has been washed in distilled water and dried at 100°, it will scarcely be believed that it amounts to 20·8, and that some is still retained in the wool. It is, however, the result of an experiment made on two samples of merino wool; one of which was procured from lambs, and the other from full-grown sheep. I am far from affirming that the wools of different breeds ought to contain the same proportion of fatty matter, for this reason, that my experiments relate as yet only to merino wool.

Alcohol separates scarcely 0·03 of fatty matter from wool which has been subjected to the operations of cleansing and of washing in the large scale; whence it follows, that it loses 17 per cent. of it in the operations of spinning and dyeing.

The theory of these operations having never been accurately given, I will explain it as I conceive it, resting on the preceding observations and experiments, to verify the conclusions which I have drawn from them.

If wool be treated only by pure cold water, the soluble foreign matters are separated: as for the fatty matter, it remains fixed in the wool, and retains the most divided earthy parts of the sand, which fleeces always contain; these earthy parts, being more or less colored, deteriorate the whiteness which is proper to wool perfectly washed and cleansed.

In the large way, the water of a boiler is charged with the soluble, greasy, foreign matter, which renders the water alkaline and rather saponaceous, although this matter cannot exactly be assimilated to a soap: the alkalinity of the water is increased with ammoniacal urine, sub-carbonate of soda, or soap: the energy of the alkaline water may afterwards be increased from 60° to 75° in general. The fatty matter then forms with the hot alkaline water, *not a solution*, since saponification cannot occur, *but an emulsion*. This emulsion is separated from the wool, because it is persistent, and its stability is further increased by adding to the cleansing bath a certain quantity of earthy milk, by which the fatty matter is dispersed. Lastly, by means of the quick stirring which the wool undergoes in the baskets, where the water is continually renewed, all the foreign bodies may be separated, and may be removed by a mechanical action, and the soluble matter of the liquid of the boiler which moistened it.

If it be desired to appreciate the influence on the cleansing of the alkalinity of the water, of its temperature, and to be convinced of the necessity of separating the greater part of the fatty matter from the wool, in order to obtain it as white as possible, the following observations must be taken into consideration:—

1st. Cold water containing sub-carbonate of soda forms an emulsion with wool which has been washed with distilled water, whilst pure water does not do so. The first liquid separated from the wool, deposits an earthy matter, and yields much stearerine and elaierine to alcohol: the turbid liquid separated from the evaporated deposit, also yields some to the same solvent.

2nd. Water which has been digested at 75° on wool washed with cold distilled water, becomes emulsive, because a portion of fatty matter, truly very trifling indeed, is disseminated in the water.

3rd. If wool which has been washed in cold distilled water be incinerated, it is found to contain 46-thousandths of earthy matter; whilst, if a sample of the same wool be incinerated after it has been subjected to alcohol and has become white, the ash scarcely amounts to 9-thousandths. Indeed, a proof of the influence mechanically exercised by the fatty matter on the color of the wool, is, that if a few grammes of wool be simply washed in cold distilled water, it will be perceived at the same time that the alcohol dissolves the fatty matter, that the wool is bleached, and that the argilo-ferruginous matter which deteriorated its whiteness, is precipitated.

The following table shows the respective proportions of matters which I have withdrawn from a merino fleece. Their weights were determined at the degree of desiccation effected by a temperature of 100° C.

	Earthy matter deposited from distilled water in which wool had been washed	26·06
	Dirt dissolved by cold distilled water	32·74
Wool washed with cold distilled water.	Fatty matter composed of stearerine and elaierine	8·57
	Earthy matter fixed in wool by the fatty matter	1·40
	Wool freed from grease by alcohol	31·23
		100·00

III. OF WOOL DEPRIVED OF ITS FATTY MATTER.

Wool deprived of its fatty matter, examined microscopically in comparison with wool of the same kind retaining its fatty matter, differs much from it: it presents cylindroid threads, the angles of which are not clear but are loaded with small rugged masses, whilst the second shows cylindroid filaments with transverse striæ, the angles of which are very clear.

Wool deprived of its fatty matter, exposed to a temperature of 160° centigrade, during six hours, comparatively with wool which still contains its fatty matter, assumes a light yellow color, whilst the other samples become brown. Indeed the spun wool which yielded from 2·4 to 2·8 per cent. of fatty matter to alcohol, submitted to the same experiment, as compared with wool which had not undergone treatment by alcohol, was less colored than the latter: but my experiments do not authorise me to attribute to this cause alone, the phenomenon of which I speak.

Since the fatty matter does not contain sulphur, it is evident that wool treated by alcohol ought to exhibit, like that which has not been, all the phenomena of coloring by the metals which act on this sulphur, producing colored sulphurets.

Wool, subjected to the action of alcohol, gave more sulphuric acid when it is treated by nitric acid, than ordinary wool. The first produced 2·22 and the second 1·78: however, I should observe that these results are not exactly comparable, because the wools were of different kinds.

IV. SEPARATION OF THE SULPHUR FROM WOOL.

The fact that wool may lose some of its sulphur without any perceptible alteration in its structure, and the analogous fact, that sulphur may quit it in order to unite with certain metals, with lead, for example, have led me to endeavour, if possible, to separate the sulphur from it. After a few trials, I submitted the wool to the following treatment. Unfortunately I was obliged to take a spun wool different from the merino wool of which I availed myself in the experiments detailed in II. and III.

1 part of wool, ½ of lime, and 40 parts of water, were macerated together for 48 hours.

The wool was washed, and wrung, then treated by dilute hydrochloric acid, and again washed and wrung.

The lime separated the sulphur in the state of sulphuret of calcium and the hydrochloric acid again disengaged hydro-sulphuric acid from the lime.

The wool did not show any sign of being weakened until the eleventh treatment. It underwent 28 macerations of 48 hours each, and was treated 28 times by hydrochloric acid. The whole of the operations lasted six months.

V. ON WOOL SEPARATED FROM ITS SULPHUR.

Wool which has been subjected to the desulphuring action of lime is much weakened in its tenacity. Examined with the microscope in comparison with a sample of wool containing sulphur, instead of exhibiting, like the latter, cylindroid filaments with clear, rectilinear angles with transverse striæ, the desulphured wool presented many flattened filaments ragged at the edges, with longitudinal striæ, which would seem to indicate that the interior of these threads had been exposed by the numerous wringings which the matter undergoes in the chemical action.

Wool separated from its sulphur yielded only 0·005 of ashes.

Boiling alcohol separated from it 2·82 of fatty matter, while from the same kind of wool which had not been deprived of its sulphur, only 2·4 was extracted: the variation was probably owing to the difference of the state of physical division of the two samples.

The desulphured wool, even that which had been submitted to the action of alcohol, assumed, by the action of a temperature of 160° C., kept up for six hours, a much more intense orange colour than wool which had not been desulphured.

Lime did not deprive the wool of all its sulphur; for by treating it with nitric acid, it was proved still to contain 0·46, instead of about two parts, which it contained previously. However, it is easy, by comparative experiments, to perceive that desulphured wool is not colored, or at any rate, only very slightly, by the metallic bodies which color ordinary wool powerfully.

VI. DEDUCTIONS FROM THE ABOVE EXPERIMENTS IN A MANUFACTURING POINT OF VIEW.

In remarking to the Academy, at its sitting of the 26th of December, 1837, the serious inconvenience arising from the presence of copper in wool intended to receive designs, of which the colouring matter must be fixed by steam, and afterwards appear on white or very light colored grounds, I did not point out, in a positive manner, the chemical condition of the copper in such cases: I now show that the metal, under the influence of steam, combines with the sulphur, and produces with it an orange brown sulphuret.

I would call the attention of manufacturers to the necessity of keeping copper tools and preparations away from wool intended to receive light colors.

Experiments should be tried in order to ascertain accurately the influence which the fatty matter of wool, simply cleansed with pure water, exerts in spinning, comparatively with the influence of olive-oil added to wool which has been perfectly freed from grease before spinning.

VII. DEDUCTIONS FROM THE ABOVE EXPERIMENTS IN A PHYSIOLOGICAL POINT OF VIEW.

I insist on the analogy between the two immediate principles of the fatty matter of wool, and those of the fats of the cutaneous tissue, in this respect, that stearerine and elaierine differ from one another in fusibility, precisely as margarine and stearine do from oleine: but at the same time I would remark, that the property of being saponified, which the three latter principles possess, sufficiently distinguishes them from stearerine and elaierine.

I insist also on the presence of sulphur in a compound still unknown, which is distinct from the filamentous part of wool, and which is intimately combined with it. I have remarked that under the influence of heat, of alkalies, and of certain metals, this sulphur leaves the wool, and that from being latent, it becomes perceptible, whilst it retains its latent condition for whole years in wool steeped in distilled water.

Finally, it would appear, considering the latent state of the sulphur in albumen and wool, that the opinion of Mr. Hatchett, who regards the latter substance as coagulated albumen, may not be utterly improbable.

ON A PROCESS FOR GILDING METALS WITHOUT THE INTERVENTION OF MERCURY, BY ELECTRO-CHEMICAL ACTION.

BY PROFESSOR DELARIVE.

Observing the injurious effects of employing mercury in gilding, I had long been of opinion that the decomposing power of the electric current, applied to a solution of gold, might, by bringing that metal, particle by particle, upon the object to be gilt, be substituted in many cases, if not in all, for the use of mercury. The first experiments which I made with this view were fifteen years ago: they were not successful, and I then ceased to apply myself to this subject. The investigations which, since that period, have been made in electricity, and above all, the numerous important discoveries of M. Becquerel, have induced me to make new experiments conducted in a rather different manner: and I think I have arrived at a process which, if not quite perfect, is, at all events, of a nature to furnish very useful results, and to become, in the hands of the experienced, of universal and advantageous employment.

The principles by which I have been guided in this application of the decomposing power of the electric current to the gilding of metals, are as follows:—

1st. The employment of weak electrical power to effect decompositions when we desire to obtain a regular and uniform deposit of the particles of one of the elements of the liquid which is decomposed, namely, of the particles of the gold which is in the state of a chloride in solution.

2nd. The employment of a diaphragm of bladder to separate two solutions placed one after another, in the same electric circuit, in order to avoid their being mixed, without preventing the electric current from traversing them successively. One of these is the solution of gold: the other is water slightly acidulated, which is used to produce the current by its action on a sheet of zinc steeped in it.

3rd. The third principle is the property which the electric current possesses, of passing with greatest facility from a liquid into a metal, and *vice versâ*, when the metal is most susceptible of being chemically attacked by the liquid. In the present case, the metal which is steeped in the solution of gold is more attackable by the liquid than the gold itself: from this it results that the immerged part will not be entirely gilt, the current will seek the points where the metal is still bare, to traverse them and deposit the gold in them, whatever may be the length of the course which it has to pursue in the liquid, or however irregular and complicated may be the object which we desire to gild.

The following is the mode in which, after various experiments, I have been enabled to apply the three preceding principles to gilding: the first two are due to M. Becquerel; and the third was explained for the first time in a memoir which I published in the *Annales de Chimie et de Physique* for 1825.

I pour a solution of chloride of gold, as neutral as possible, and very dilute (5 to 10 millegrammes per cubic centimeter of the solution), into a cylindrical bag, made of bladder: I put this bag into a glass matrass, containing very slightly acidulated water. The object which I wish to gild communicates, by means of a metallic wire, with a plate of zinc, is steeped in the acidulated water, and is itself placed in the solution of gold. If desired, the acidulated water and the zinc may be put in the bag of bladder, and the solution of gold and the object to be gilt, in the glass matrass. In about a minute, the object may be withdrawn and wiped with a fine cloth; by rubbing it with this cloth it is found already to be a little gilt; after two or three similar immersions, the layer becomes so thick that it is unnecessary to continue the operation any longer.

I shall not enter into a detail of all the precautions indispensable to success: I will content myself with pointing out a few of them.

The electric current must be very weak: we should avoid, as much as possible, a disengagement of hydrogen on the object to be gilt, which too great an intensity of current might cause, as, if it were too abundant, it might prevent the gold from depositing solidly. Consequently, only a few drops of sulphuric or nitric acid must be put into the water in which the zinc is steeped, and this metal must not be sunk lower than just enough to establish a sufficient current, which, with a little practice, may easily be attained.

The object which is to be gilt may previously be scoured and polished with care, or simply scoured. In the first case, after the operation, it has a brilliant gilding, which seems to have been submitted to the action of burnishing: in the second, the gilding is dull; it resembles that obtained by withdrawing from the fire objects which have been gilt by amalgam: perhaps the layer of gold is thicker; what leads me to suppose so is, that a greater number of immersions are required to effect the gilding. In both cases, it is equally necessary to scour carefully, and above all, to free from grease, and to cleanse, the object to be gilt: it is also right to wash it in slightly acidulated water every time it is withdrawn from the solution, before wiping and rubbing it, and even after it has been rubbed, before it is again immersed. A very good means of scouring it consists in making it communicate for a few minutes, in acidulated water, with a piece of zinc which, forming with it a couple, determines on its surface an abundant disengagement of hydrogen.

The color of the gilding seems to depend on several circumstances: on the quality of the gold which is dissolved, on the nature of the metal to be gilt, and on the degree of concentration of the solution of gold. The previous polishing of the surface, or its omission, seems also to affect the color: when it has not been polished beforehand, the gilding is much more red, which probably is attributable to the gold being deposited on a rough and not quite level surface; their mutual inclination causes a play of light similar to that which takes place in the interior of a gilt vessel: it is very curious that burnishing does not destroy this effect.

It is necessary to be very careful that the object to be gilt should not be put in contact with the solution of gold until everything is arranged, so that the electric current may take place only when this contact is established; otherwise, the direct action, without a current, would prevent the gilding from taking place properly, especially if silver were being operated on.

This process appears to me very economical. Everything except the gold is very cheap: and as for the gold itself, very little is required for a tolerably beautiful gilding. I have gilt ten silver spoons with a solution containing 800 milligrammes of gold. Supposing that the gilding of the ten spoons took up all the gold in the solution, which, however, was not the case, each spoon would have taken up 80 milligrammes of gold—that is to say, for about 32 centimes, (rather less than threepence English,) taking the price of gold at 4 francs (about 3*s.* 1½*d.* English) the gramme of fine gold, which is rather high. It is true that the gilding was not very thick: it was of the fine greenish-yellow called English gold; however, it resisted repeated frictions. A temperature of 300° or 400° did not alter it; it only made it penetrate farther into the surface of the metal: but a single gilding, over the first, produced a very thick layer, which probably was very durable.

By means of the process which I have just described, I have gilt wires, plates, silver coffee spoons, and brass watch-cases: I have succeeded also in gilding some watch wheels: the extremities of the teeth were well gilt, but the color was not such as watchmakers prefer: it was too red. I am now endeavouring to discover the means of rendering it yellower and more dull (*mate*). It appears to me, that every object, of whatever form, may be gilt by this means. A surface may also be partially gilt, either by covering with wax the parts which are not to receive the gilding, or by spreading the solution of gold, with a pencil, on the parts to be gilt. Thus may be produced on a surface, by gilding, traces whose outlines form letters or figures.

In conclusion, I may add, that since the completion of my work, I have been made acquainted with a process used in Germany and England for gilding with a solution of oxide of gold in potassa. This process, which has not been generally adopted, requires the employment of a high temperature, whilst the electro-chemical one does not. It does not present the advantage, like the latter, of removing the oxygen and chlorine from the gold, and of preventing them from attacking the object to be gilt, as is the case with the electro-chemical process, which, by the power of the electric current, transports them to the zinc in the acidulated water. Moreover, the purely chemical process produces only a tarnished and dull gilding. I consider it also less economical: indeed, it appears to me to present many more inconveniences than the electro-chemical process: of which, however, practical men will be the best judges. Be it as it may, experience will decide which of the two processes has the superiority. What has encouraged me to make mine public is, even should it have but a partial application, that I have observed that the purely chemical process seems to be abandoned, and that that which is founded on the employment of mercury continues to be made use of in many cases, in which, as I have already ascertained, the electro-chemical method might be substituted with advantage.

ON LINSEED OIL AND LINSEED OIL VARNISH.*

BY JUSTUS LIEBIG.

It is on the property which linseed oil possesses, of being gradually transformed into a brilliant and drying substance, that its important employment in the arts and in painting is founded.

The rapidity with which this change, this desiccation of linseed oil, is effected, depends partly on its age: recent linseed oil requires a longer time than old oil, which has formed a deposit. This transformation may, as we know, be greatly accelerated by boiling linseed oil either alone, or with the oxide of lead or of zinc: in this state it is called linseed oil-varnish. This varnish is more or less colored, and thicker than the oil used to prepare it: in the space of twenty-fours it is converted on glass plates at the ordinary temperature, into a non-glutinous layer as shining as glass; whilst linseed oil requires eight or ten days to undergo the same alteration.

The modifications which linseed oil undergoes in passing to the state of varnish, have been very little studied; according to the most common opinion, the oxide of lead partially reduces it. The oil seizes the oxygen and oxide of lead, and thus undergoes, during the preparation of the varnish, some of the modifications, which could take place in the air only after a greater lapse of time.

According to investigations which I have undertaken concerning the preparation of varnish, this opinion is unfounded: it would appear, on the contrary, that the transformation of linseed oil into varnish is based on the elimination of substances which oppose oxidation. My experiments have not been made with the object of discovering the cause of the alteration which linseed oil undergoes in its contact with oxygen: they are confined to the action of oxide of lead on linseed oil, and to the best mode of preparing varnish.

Saussure's experiments on the action of oxygen gas on drying oils, show an extraordinary difference with respect to the time of the absorption of oxygen; this absorption is, as it were, operated by fits. A layer of nut oil, for example, absorbed in eight months only three times its volume of oxygen; at the end of this time he observed an increase, disproportionate in rapidity, which was such, that the same layer had, in the ten days following, absorbed twenty times as much oxygen as in the eight months previous.

This extraordinary phenomenon can be explained only by the presence of a foreign substance, which being dissolved in the oil, prevents the contact of the oxygen, and which undergoes an oxidation similar to that of the oil, although more slowly. I shall not decide whether this substance should be called mucilage; it results, at all events, from the vegetable albumen of the seed employed for the extraction of the oil.

The action of oxygen on the oil itself must be prevented by this mucilaginous matter; it may be represented as enveloping the particles of oil, and neutralizing their property of absorbing oxygen, until it is itself destroyed.

The following investigations will, perhaps, be sufficient to justify the opinion which attributes the transformation of linseed oil into varnish, to a purification of the oil, the sole condition of its property of solidifying in the air.

If mere boiling augments, as we know it does, this property, it is still farther increased when we add to the boiling oil oxide of lead, acetate of lead, or oxide of zinc. Boiling at a high temperature gradually destroys the mucilage: there occurs a solution of oxide of lead, and the formation of a compound which remains dissolved in the excess of oil.

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* *Annalen Der Chemie und Pharmacie.*

Both pure boiled linseed oil, and linseed oil with oxide of lead, dry very rapidly in the air; but the latter seems to possess this property in a much higher degree. It is, I think, a mistake, inasmuch as the judgment refers to the state of viscosity, which both assume, by exposure, in thin layers, to the air. Linseed oil, boiled with oxide of lead, is thicker, and holds in solution a solid combination, whose separation naturally renders the oil, which thickens, more glutinous than linseed oil submitted only to boiling.

I supposed at first, that the formation of varnish was owing to saponification, or to a destruction of the glycerine; the one caused by oxide of lead, and the other, by elevation of temperature.

This opinion seemed to be justified by the fact, that linseed oil heated to 100° centig., mixed with litharge, and through which steam was passed, for the space of an hour, was converted into an excellent varnish, which dried quickly and easily in the air, and was but slightly coloured. But when a mixture of linseed oil with litharge and water was boiled for a longer time, a thick mass was obtained, which dried with great difficulty in the air, and retained, for a long time, an unctuous consistence. To remove all doubt that saponification is not necessary to the formation of varnish, I saponified linseed oil with caustic potassa, and separated the oleic acid formed by hydro chloric acid. The oleic acid extracted from the soap of linseed oil is a thick oil which becomes a crystalline mass at 10—12°. When the solid portion is separated by filtration, at a rather high temperature, about $\frac{1}{10}$ of a white solid body is obtained, which easily dissolves in hot alcohol, and is deposited from it in fine needles, in the same manner as margaric acid. This liquid oleic acid does not dry in the air more readily than linseed oil; it dissolves, with the assistance of heat, a great quantity of oxide of lead, and when it is saturated with it, takes the consistence of a plastic mass.

When there was dissolved in it such a quantity of oxide of lead, that it might still preserve its liquid state, after cooling, a compound was obtained, which was identical in its properties with linseed oil boiled for several hours with water and litharge, that is to say, not varnish.

From the above, it results that the formation of varnish is independent of the separation of the glycerine from the oil; and that, on the contrary, this substance partakes of drying properties.

The following researches have shown me that the simplest and best method of preparing varnish is by means of subacetate of lead.

If linseed oil be carefully mixed, by stirring, at the ordinary temperature, with subacetate of lead, and the mixture be allowed to clarify by standing, a great quantity of a white slimy deposit, containing oxide of lead, is separated; the supernatant oil is converted into an excellent varnish; it has a yellowish color; and when it is spread in thin layers, it dries perfectly in twenty-four hours, and contains in solution, from 4 to 5 per cent. of oxide of lead. The following proportions are well adapted for its preparation in the large way. There are poured into a suitable vessel on 500 grammes of subacetate of lead, 2,500 grammes of rain-water, and when the solution is completed, 500 grammes of finely levigated litharge are added: the solution of the litharge may be accelerated by exposure to a moderate heat, and by frequent stirring: when no more bracteæ of litharge can be seen, it may be considered as finished. There is formed in this operation a brilliant white deposit, which may be either left in the liquor, or separated from it by filtration. Solution may be effected in a quarter of an hour by boiling; but if no heat be employed, the mixture must be left to itself for several days.

The solution obtained serves for the preparation of 10 kilogrammes of varnish: it is diluted with its own volume of water; and 10 kilogrammes of linseed oil, into which 500 grammes of levigated litharge have been distributed, are added by degrees, stirring frequently. By renewing, three or four times, the contact of the lead solution with the oil, by repeated stirrings, and then leaving the mixture to clarify in a warm place, the yellowish and clear varnish is obtained floating on the aqueous liquor, in which is found the white deposit, and of which there has been a question. The filtered aqueous solution contains all the acetate of lead first employed: it may be used for all subsequent preparations, instead of a fresh solution of acetate of lead, after 500 grammes of litharge have again been dissolved in it.

To obtain limpid varnish, it is necessary to filter it through coarse unsized paper, or through cotton: there is then separated from it a white powder, which is but very slowly deposited by standing. It may be bleached by exposure to the sun. If a varnish free from oxide of lead be required, it is sufficient to stir in a little dilute sulphuric acid, and to leave the liquor to stand: sulphate of lead is then separated from it, and the varnish, free from lead, floats above; it is limpid and in a state of purity.

RESULTS OF M. PLAGNE'S INVESTIGATIONS CONCERNING THE COMPOSITION OF THE JUICE OF THE SUGAR CANE.*

EXTRACT OF A LETTER FROM M. COLIN.

In a recent work, (see *The Chemist*, No. V., p. 148,) M. Peligot considers the juice of the *Arundo Saccharifera* as water containing sugar, wherein the saccharine matter, which is quite crystallizable, amounts to 18 or 20 per cent. This, as MM. Robiquet and Guibourt have remarked, is precisely the same conclusion as that drawn some years ago by M. Avequin in his investigations concerning the composition of the sugar cane.

M. Plagne, one of my old assistants at the Polytechnic School, arrived at the same results in 1826. His experiments, communicated in five addresses to the Minister of Marine in 1827, show:—

That the juice of the *Arundo Saccharifera*, both from Martinico and from the coast of Coromandel, contains more than 20 per cent. of crystallizable sugar, and that the whole of it might be obtained, provided that it were evaporated at a temperature not exceeding 100° C.

That by operating thus, little or no molasses is obtained.

That this rapidity in evaporation is the more desirable, because the juice of the sugar-cane contains a matter which, if done slowly, would transform the whole of the sugar cane into a viscous substance.

I shall presently revert to the nature of this ferment; but I must first communicate the result of M. Plagne's analysis of the juice: he operated on four thousand grs.:

Water	3133
Crystallized sugar	832
Uncrystallizable dry residue	30
Cerine	0·30
Green Wax	1·06
A peculiar organic matter	1·61
Dry albumen	0·30
Total	3998·27

Differing but 7 decigrammes from the four thousand grammes used for the experiment.

The peculiar organic matter which was observed by M. Plagne in the juice of the *Arundo Saccharifera*, and which does not amount to a two-thousandth part of it, is that which transforms the sugar into a viscous matter, when its evaporation is not proceeded with immediately, or is carried on too slowly.

M. Plagne discovered in it the following properties: it is white, turning brown on exposure to the air; soft, attracting moisture slightly, and drying difficultly. It is insoluble in alcohol and in ether, soluble in water, not azotic, burning without turgidity, with a smell resembling that of extract of chicory. The salts of protoxide of mercury and lead precipitate it from its aqueous solution; perchloride of mercury does not affect it; and alcohol and ether separate it with its primitive properties, from water which has dissolved it. Animal charcoal combines with it; but for this purpose, it is necessary to increase its quantity, and to put a portion of it in the juice at the moment it flows from the cane, in order to prevent viscous fermentation.

The viscous matter into which sugar may be transformed by the substance which has just been described, does not yield carbonate of ammonia by distillation, whence it may be inferred that it does not contain azote. Water dissolves it, and alcohol precipitates it from the aqueous solution: it has, therefore, the properties of gum; however, treated by nitric acid, it yielded only oxalic acid. Is not this matter analogous to that which M. Peligot has obtained from certain fermentations, and which he has considered, I believe, as anhydrous sugar?

May not the sort of ferment noticed in the juice of the cane be the same as that observed by M. Bracconnot in the tubercles of the helianthemum?

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* *Comptes Rendus*, No. 13.

ON MR. TALBOT'S PHOTOGENIC DRAWINGS.*

BY M. BIOT.

I have the honour, on the part of Mr. Talbot, of presenting to the Academy, forty photogenic drawings, produced under various circumstances upon sensible papers. Some were obtained by application, others by direct action in the camera obscura. Their execution appears to me at least to equal every thing of this kind, which has hitherto been presented, especially considering that many of them, and some of the most satisfactory, were executed under all the disadvantages of the present season. Mr. Talbot has not communicated to us his process, not with the intention of making it a mystery, but because he hopes to increase its sensibility, and because he awaits the return of fine weather to enable him to realise the improvements which he has in view. The results, such as they are, already present many indications which are very valuable in physics: and, in order that they may be better understood, I will precede the exhibition of the drawings by a few remarks which have been suggested to me by their inspection, or which I have found in Mr. Talbot's letters.

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* *Comptes Rendus*, No. 13, March 23, 1840.

It is not to be expected that photogenic drawings, made on paper, can ever equal the clearness and fineness of those obtained on level and polished metallic plates. The texture of paper, its superficial roughnesses, the depth of the imbibitions, and the capillary communication established between the various unequally marked parts of its surface, are so many obstacles to absolute strictness of delineation, as well as to the regular gradation of tints in the camera obscura; and the influence of these obstacles is greater when the chemical operation is slowly carried on. But when there is no pretence or necessity for submitting to the delicacies of art, when it is required, for example, to copy rare manuscripts faithfully, if we have papers which are very susceptible of receiving impressions in the camera obscura, they will suffice perfectly; particularly when they present, like those of Mr. Talbot, the facility of immediately procuring copies of the primitive drawing. It will therefore, doubtless, be found more commodious, and often even more practicable, to put four or five hundred drawings in a portfolio, than to carry about a similar provision of metallic plates with squares of glass to cover with these indispensible protectors, perfect prints, it is true, but which are as light as the vapour from which they are produced; and, indeed, to bring the voluminous collection of these fragile products through the accidents incident to long, difficult, and sometimes perilous voyages. Attempts are being made, at this time, to fix the images produced by the Daguerreotype. But whoever has attentively studied the combination of physical conditions whence these admirable images result, will find it very difficult, I am far from saying impossible, to fix them without destroying, or at least without essentially altering the causes which produce their charm: and then, for the purposes which I have mentioned, papers very susceptible of impression would still have the advantages of a less troublesome removal from place to place, as also of more easy preservation.

The utility of sensible papers for copying texts was a natural consequence of the clearness of the copies of engravings which Mr. Talbot had already obtained by application, and which were presented to the Academy. He has included others among those just sent: there are also added specimens of this especial application, consisting of copies of a Hebrew psalm, of a Persian Gazette, and of an old latin chart of the year 1279. Our brethren of the *Academie des Belles Lettres*, to whom I exhibited these impressions, were pleased to remark the fidelity of the characters, and their clearness, by which they are rendered as legible as the original text. Doubtless an old manuscript may be copied more quickly and more accurately by this means than by hand, even when the language in which it is written is understood. However, we must stop here. These copies are obtained by application: we must be enabled to obtain them by immediate radiation in the camera obscura. It is the only means of extending the process to papyrus and other opaque manuscripts, or which are not sufficiently transparent for radiation to traverse them. Moreover, the application of leaves is very difficult when they are bound up in a volume, and cannot be detached from one another.

But this important extension will require much physical perfecting, towards which experimenters should direct their efforts. The first thing will be to augment the sensibility of the paper as much as possible, in order that the capillary communication of its various parts may not have sufficient time to deteriorate the effects of the local and immediate action of the radiation. I should be led to believe that it is principally to this kind of communication should be attributed the fact remarked by Mr. Talbot, that in experiments by application, it is more difficult to copy clearly a tissue of black lace spread on a white ground, than white lace on a black ground, two cases, of which he here gives examples. But another more hidden and more general difficulty seems to me to proceed from the unequal faculty of various substances, for reflecting the radiations which strike them, and perhaps from their aptitude for making them undergo physical modifications. For example, you wish to copy by radiation in the camera obscura a picture painted on canvas, wood, or porcelain: the different coloring substances employed by the painter are placed and distributed in such a manner that each of them absorbs certain portions of total incidental light, and reflects especially towards your eye the complementary portions, wherein predominate the rays proper to form the tint of which it would give you the sensation. But the chemically active reaction which the same parts of the picture receive and reflect is distinct from the light which affects your retina.* In order that the chemical effect which it produces on the sensible paper, or on M. Daguerre's layer of iodine, may present in light, or in shade, the equivalent of the colored shades, it is requisite, 1st, that this reflected radiation be chemically active: 2nd, that the energy of its action be proportional to the intensity of illumination operated in the eye by the portion of luminous radiation reflected from the same point of the picture. Now this latter concordance certainly should not be fulfilled in an equal degree, by the various coloring matters, which affect the eye in the same manner, and which the painter may substitute for one another in his work. Substances of the same tint may present, in the quantity, or the nature of the invisible radiations which they reflect, as many diversities, or diversities of the same order, as substances of a different tint present relative to light: inversely they may be similar in their property of reflecting chemical radiations, when they are dissimilar to the eye: so that the differences of tint which they presented in the picture made for the eye will disappear in the chemical picture, and will be confused in it in a shade, or an uniform whiteness. These are the difficulties generally inherent in the formation of chemical pictures; and they show, I think, evidently, the illusion of the experimenters who hope to reconcile, not only the intensity, but the tints of the chemical impressions produced by radiations, with the colors of the objects from which these radiations emanate. However the distant or near relations of these two species of phenomena are very curious to study, not only as regards the photogenic art, since that name has, very improperly, been given it, but likewise as regards experimental physics. I doubt not that examples may be remarked in the images of natural objects and colored pictures executed by the Daguerreotype; but very apparent ones may be seen among Mr. Talbot's present impressions. Thus, some of them represent white porcelain vases, colored shells, a candlestick (of metal) with its taper, a foot of white hyacinths. The whole of these objects are felt and perceived very well in their chemical image: but the parts which reflect the purely white light, probably also the radiations of every kind, are, relatively to the others, in an exaggerated proportion of illumination, which, it seems to me must result, partially, from the capillary communication during the continuance of the action, so that the inequality would be less if the paper were more sensible or more rapidly acted on. In the hyacinth, the stalk and the green leaves produced scarcely a faint trace of their configuration; and they produced it especially in the parts of the outline where more or less perfect specular reflection is operated. The points of the candlestick (metallic) where this reflection occurred, are copied by white stains locally applied, and which deteriorate the effect of the whole by their disproportion. But that is seen especially in a picture by Correggio, the frame of which was very vividly copied, whilst the figure on the canvas was hardly perceptible. This disproportion of lustre in the reproduction of some white parts, especially when they are dull and consequently very radiating, is sensible in certain parts of views taken by Mr. Talbot, to the point of rendering difficult the interpretation of the object to which they belong. However, these views are very satisfactory, as being obtained on paper, in the present season. Moreover, by an advantage peculiar to the chemical preparation which Mr. Talbot uses, it appears that the operations once completed, the drawings are no longer alterable by radiation, even acting with much energy. Indeed we have here as an example, four proofs of the same view of Mr. Talbot's house, with an identical disposition of lights and shades: so that some, at least, if not three out of four, must have been procured by superposition. Mr. Talbot is right in representing this property of reproduction as an especial advantage of his process, and it would indeed be very useful in voyages. I have exposed one of these drawings to the action of the sun, not very powerful, it is true, for several hours; and I have not perceived the slightest alteration in the lights. I think I understand that, in Mr. Talbot's opinion, the shades alone are strengthened under this influence. According to what I have just said, it should be expected that the triumph of this process, as of every other photogenic reproduction, would take place with objects of white and dull plaster. Indeed, Mr. Talbot's parcel contains eight copies of busts and statues; six of which chiefly, of various forms and sizes, present very remarkable results, especially taking into consideration the unfavourable season at which they were produced. Truly, there is not found in them the strict perfection of trace, nor the admirable gradation of lights and shades which constitutes the charm of M. Daguerre's impressions, and I again repeat it that my expressions may not be exaggerated. But I also repeat, that representations on sensible papers must be considered as principally applicable to a different object, which does not impose such strict conditions of art, requiring only faithful images, sufficiently clear in their details to be readily recognised, and which, moreover, being obtained with rapidity, by an easy manipulation, may be kept with very little care, comprised in great number in a small compass, and moved from place to place with facility. Mr. Talbot's papers already present many of these essential qualities, with the advantage of being able to furnish numerous copies immediately. His efforts, and those of others occupied with the same subject, will conclude by adding to them every thing which may be desirable, provided that expectation, or the pretension of a perfection of art physically incompatible with operations on paper, do not give a false direction to their endeavours. However, not to appear to despair too much of the future, I may add that the height of success would consist in discovering a substance very susceptible of receiving impressions, which might be applied on a papyraceous leaf without penetrating deep into it, and which might, however, be fixed in it after the operation, as in Mr. Talbot's impressions. It does not seem necessary even that the first impression thus rapidly obtained, should copy the lights and shades in their proper places, provided that its transparency and fixedness were such, that we might deduce them from the application of copies wherein the inversion would be corrected. And perhaps, by this decomposition of the problem into two successive operations, one of the best ways is opened by which it may be resolved.

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* I presume that the reader admits this as a fact established by the experiments which I published in the *Comptes Rendus* for 1839, 1ère sem.

FIXATION OF PHOTOGENIC IMAGES ON METAL.*

In reference to a passage in the preceding article, respecting the little chance of success in attempts to fix photogenic images on metal, M. Arago remarked that these experiments, though of recent date, had yielded results which were far from discouraging, and that an impression presented by M. Fizeau announced a new advance. Indeed, if in the impressions which have just been exhibited to the Academy, the drawing, although retaining its fineness, appeared to have lost lustre, the same reproach cannot be attached to those of M. Fizeau, which is not inferior in vivacity to the most beautiful images produced by the Daguerréotype, and which, however, has acquired, by means of the operation of fixing, sufficient solidity to allow of its being kept without any other precautions than those required by ordinary drawings.

M. Fizeau asserts that the operation to which he submits the photographic images, far from rendering them pale, has, on the contrary, the property of increasing the vigour of the shades and the brilliancy of the lights.

PHOTOGRAPHY.

At the sitting of the Academy of Sciences, on the 13th of April, M. Séguier, in the name of M. A. Masson, presented several Italian landscapes obtained by photographic processes, and a copy, obtained by the same means, of an oil painting (a Madonna by Raphael). M. S. observed that all these impressions were obtained on plates prepared by a simple scouring with acidulated water mixed with tripoli, without oil polishing and without heat. He added that the exposure of the plates in the camera obscura had in no instance been continued beyond ten minutes, and that sometimes four minutes had been sufficient.

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* Academy of Sciences, sitting of the 23rd March, 1840; from *Comptes Rendus*, No. 12.

III. PHARMACY, &c.

ON THE PREPARATION OF SANTONINE.*

BY M. A. GUILLEMETTE.

Having lately had occasion to prepare santonine for pharmaceutical purposes, I had recourse to the processes described by MM. Kœhler and Merck. One of these consists in treating the seed by sulphuric ether, distilling this tincture, and redissolving the crystals formed in ether; and finally in purifying them, and dissolving them in alcohol, to which a little hydrochloric acid is added. The other consists in submitting semencine to the action of hydrate of lime and alcohol, distilling the tincture to one-fourth, filtering in order to separate the residue, then in treating with the assistance of heat, the alcoholic extract by concentrated acetic acid, which, on cooling, allows santonine to crystallize. After having repeated the solutions and crystallization in alcohol mixed with charcoal, it is obtained in a state of purity.

These processes succeed very well, and allow nearly all the santonine to be extracted from the semen-contra; but they appeared to me very expensive.

Several German physicians having discovered in this substance very decided vermifuge properties, in doses of 30 or 40 kilogrammes, I thought it might not be uninteresting to publish an easy and less expensive method of obtaining it, and to put physicians and physiologists in a situation to judge of its medical uses. I wish, in calling attention to it, to see it one day used as a medicine for children, to whom its nature allows it to be administered with facility.

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* *Journal de Pharmacie.*

The chemical properties of this substance are very remarkable, and have been very well studied by the chemists who have made us acquainted with them. It occurs in beautiful crystals, which are elongated quadrilateral tables: its solutions have a bitter taste. It is neither alkaline nor acid: however, it combines very readily with bases, and gives with lime, baryta and oxide of lead, crystallizable salts. When a mixture of santonine, lime, water and alcohol is heated, the liquor becomes red; and when it is cooled again, the salt crystallizes in red silky needles, which become white spontaneously. I shall profit by the facility with which I am now able to obtain this substance, to study its properties farther. If my experiments give any interesting results, I shall have the honour of submitting them to the Society of Pharmacy.

The following is the process which I have found most successful: 2,000 gr. of semen-contra of Aleppo were reduced to a rather fine powder, made into a paste with cold water, and submitted to pressure after eighteen hours' maceration. The pulverized cake was again set to macerate, and pressed eighteen hours afterwards. The expressed matter, dried, and pulverized, was put in contact with alcohol at 89° cent. and pressed after twenty-four hours' maceration. This manipulation is continued until it is exhausted.

The alcoholic solutions were mixed together and filtered, then distilled in a sand-bath to about 350 grammes. This tincture, left in a capsule, very soon allows all the santonine which it contains to crystallize. One part adheres to the capsule: the other remains mixed with resin, volatile oil and chlorophyle. It may be separated from these substances by decantation, and by squeezing the crystals in a piece of linen. They are purified with boiling alcohol and charcoal. Two crystallizations are sufficient to obtain it pure.

A kilog. of seed yields nearly 4 drachms of santonine.

CASE OF POISONING BY COLCHICUM SEED.*

BY DR. NEUBRANDT.

Caspar B., of Acsthausen, aged 52, of a sanguine temperament, drank by mistake, on the night of the 18th of February, 1830, some of a decoction made with a large spoonful of colchicum seed and three pints of water: he had, in the night, more than 15 stools and vomitings. When Dr. Neubrandt saw him next day he was in a disturbed state. The stools and vomitings were less frequent: the patient, although weak, did not complain of any pain, and could raise himself: the abdomen was not distended, and it contracted spasmodically on being touched: the pulse was small and subfrequent: the stools, which were very fetid, contained small whitish membranes. The patient was made to drink a great quantity of warm water containing butter. This drink provoked vomiting and stools: immediately after, coffee was ordered, and a strong infusion of marshmallow with lemon juice. Except the vomiting and stools, no symptom could be discovered which could make us suspect an absorption of any part of the poison. Next morning, the 20th, at 8 o'clock, the physician found his patient in the following state:—

Face pale, respiration precipitate, groans, hoarseness, eyes sunken, pupils much dilated, tongue covered with a whitish matter, and could be put out only with difficulty: region of the stomach rather painful, breath, face and extremities cold: pulse very frequent, scarcely perceptible: no thirst: stools more frequent since the evening, and containing matters of a light blue color. The patient took, with pleasure, some mucilaginous soups and coffee. Although he replied correctly to questions addressed to him, his intellectual faculties seemed to be confused.

Death at ten o'clock.

AUTOPSY, 23 HOURS AFTER DEATH.

Countenance unaltered, pupils much dilated, eyes sunken, mouth spasmodically closed: a remarkable striped appearance of all the members and muscles: the abdomen scarcely more swelled than during life, was of an extraordinary hardness, and showed peculiar stains, more numerous in the cavity of the stomach and at the sides, towards the back: they were violet, greenish blue, striped, not circumscribed. The muscles were of a deep blue, when dried in the air. The trachea, towards the bifurcation, was inflamed. The lungs, collapsed, small, pale, and soft to the touch, were in the normal state internally on the heart, otherwise normal and containing much coagulated blood, were large black, violet and brownish spots. The æsophagus was brownish red only to below the diaphragm and at its opening into the stomach: the cardia, especially, was of a violet black color. The stomach at its exterior surface was of a light violet, and much deeper at the interior: the veins of the stomach and other intestines were greatly distended by perfectly black blood. The liver, in normal state, had a violet tint at its concave surface: the gall bladder was bulky and full of green bile. The large and small intestines were hardly inflamed without, and showed only a few red, brownish spots within. The other organs presented nothing abnormal. The brain and the vertebral column were not opened.

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* *Medicinisches Correspondenz-Blatt.*

Cases of poisoning by colchicum, without being very rare, are seldom published by those who have observed them: the case which we have quoted above offers this peculiarity, that the symptoms, by no means alarming at the commencement, did not become serious until towards the third day. We must, therefore, be on our guard in similar cases; and we cannot accumulate too many observations to compare with the facts furnished by toxicological experiments on animals.

We find in the same journal (*Medicinisches Correspondenz-Blatt*) another case of poisoning by the leaves of colchicum: the individual died; but the treatment which was followed perhaps hastened death. Autopsy was not made.

LEECH MONOPOLY.

To the Editor.

Sir,—Although the "Leech," as regards its nature, habits, &c, belongs more to natural history than to chemistry, I trust you will admit this enquiry into your columns, in the hope that some information on the subject may be elicited from those of your readers who are retail chemists, and deal in that article.

As far as my information extends, the Leech trade is in the hands of very few: hence the price has been advancing gradually till it has reached a sum sufficiently high for both dealers and the public to make enquiry as to the cause thereof; and as there seems to be a probability of the increase of price still continuing, I presume I am justified in designating the system acted upon by the importers and merchants—a monopoly. There is only one other inference which I can draw, which is, that the supply is not equal to the demand.

Both the speckled (the genuine) and the green Leeches are in general use; and formerly a considerable difference of price existed between them. Now, however, they are nearly of the same value; and if, either by endeavouring to breed them here, (for which Naturalists should offer some encouragement,) or by the enterprise of men of business, the present system of permanent high prices could be broken up, it would, I am of opinion, benefit both the speculators and the public generally.

I am, Sir,
Yours, &c. &c.
May 15, 1840. Enquirer.

ON PITCH IN THE TREATMENT OF HÆMORRHOÏDS.

BY DR. WARDLEWORTH.

Hæmorrhoïds are of such frequent occurrence, and so often resist all modes of treatment, that we cannot multiply too much the number of means of which the utility has been demonstrated in a sufficient number of successful cases. The following, therefore, appears to us not uninteresting:—

Black pitch appears to produce advantageous effects against hæmorrhoïds. I became acquainted with this property in the following manner:—

A young woman, whom I had put to bed, was seized, six months after her confinement, with hæmorrhoïdal pains, against which the ordinary means of treatment were entirely powerless. Fatigued by many attempts, she decided on following the advice of a neighbour, who assured her that some pills of pitch would relieve her; she took two of them, and almost immediately the tenesmus which she experienced and the pain in the stomach disappeared. Some time after, meeting her and finding her much better, she related to me what had occurred, and extolled the benefits she had derived from the pitch. I could mention a great number of cases in which I have found the same means successful; but, being unable to explain its mode of action, I will content myself with saying that it is very efficacious in internal and external hæmorrhoids with or without loss of blood. The following is the formula which I ordinarily make use of:—

Black pitch....3½ grains for three pills.

Two to be taken every night, and the abdomen to be kept free. The known efficacy of balsamics in the treatment of hæmorrhoïds might, to a certain extent, account for that of pitch we have just mentioned.

SULPHUR IN RHEUMATISM.*

According to M. Rucker, sulphur is as powerful a specific for rheumatism, as mercury for syphilis. The first experiment he tried was on himself. From the age of fourteen years, he had frequently suffered from rheumatism, and believed that he had exhausted every remedy, when it occurred to him to have recourse to sulphur: he rubbed it into his legs, and put on his stockings again, in order to make it stay on. In about five minutes, he experienced great alleviation of pain: he was able to sleep, and since that time has not suffered from that painful malady; although he has several times been exposed to circumstances calculated to renew the attacks.

M. R. immediately applied this remedy to several persons attacked with the same complaint, and always with similar success.

FORMULÆ FOR LOZENGES.

BY MR. BARTLETT, CHELSEA.

CHALK LOZENGES.

1 lb. powdered sugar; 2 oz. prepared chalk, mucilage q. s.

BATH PIPE.

4 lb. powdered sugar; 4 oz. Italian juice dissolved in as small a quantity of water as possible; 2 oz. powdered gum Arabic to be mixed in very stiff, and rolled out in the usual form.

LAVENDER LOZENGES.

3 lb. powdered sugar; 1 drachm oil of lavender (English); 20 grains of drop lake rubbed up in a mortar with a little mucilage, then add a sufficient quantity of mucilage to form the mass; roll out and cut round.

BEST PEPPERMINT LOZENGES (A).

12 lb. *finest* powdered sugar; 2 scruples of smalts; 1 oz. English oil of peppermint; mucilage q. s.

If for transparent lozenges, the sugar need not be powdered quite so fine; but they must be rolled thinner.

(B.)

Use a sugar not quite so fine, and put only ¾oz. of oil.

(C.)

10½ lb. of sugar; 2 scruples of smalts; 1 lb. 8oz. of gypsum ustum (P. P. P.); ⅛oz. oil of peppermint; mucilage q. s.

(D.)

9 lb. sugar; 3 lb. P. P. P.; 2 scruples smalts; ¼oz. oil of peppermint; mucilage q. s.

MAGNESIA.

8 lb. powdered sugar, best; ½ drachm smalts; ½ lb. heavy magnesia; ½ lb. Howard's precipitated chalk; 20 drops of oil of nutmeg; mucilage q. s.

KICELAND'S DRYING PLAISTER.

Into an earthen vessel are poured four ounces of distilled vinegar, and four ounces of subcarbonate of lime; when the effervescence has ceased, four ounces of olive oil are added, and eight ounces of simple diachylon plaister; the whole is melted with a slow heat, constantly stirring with a wooden spatula. When the liquefaction is complete the vessel is taken off the fire, and when the whole begins to cool, pour in gradually 14 ounces of subacetate of lead; continue to stir until the mass has become quite cold.

ON THE PRESENCE OF PROTOXIDE OF LEAD IN THE BLOOD OF A HORSE, TO WHICH HAD BEEN ADMINISTERED, IN SEVERAL DRAUGHTS, A CONCENTRATED SOLUTION OF ACETATE OF LEAD.†

BY M. LASSAIGNE.

The experiments which have lately been made at the school of Alfort, on the administration of large doses of acetate of lead, have given an opportunity for ascertaining whether the blood of a horse submitted to the action of this salt, contains a certain quantity of it.

By my directions, M. Ausset, manager of the chemical works of the school of Alfort, undertook a series of experiments by which he has been enabled to prove that the carbon arising from the calcination of the blood of a horse, to which had been administered, at several doses, 780 grammes of acetate of lead, both in solution and in an electuary, contained, at the expiration of ten days, a small quantity of lead.

In treating, by heat, the carbon by weak nitric acid, he recognized, with the aid of re-agents, the unequivocal presence of this metal.

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* *Journal de Chimie Médicale*, May, 1840.

† *Journal de Chimie Médicale*, April, 1840.

If, as we think, lead does not make part of the elements of the blood of the horse in the normal state, it must be concluded that the salts of protoxide of lead, like some other metallic compounds which have already been examined, may be absorbed and carried into the circulation.

New experiments, on the same subject, are about to be tried; and when they are concluded, we will hasten to publish the results.

ON THE PRESENCE OF PROTOXIDE OF LEAD IN THE ANIMAL ECONOMY.*

BY M. A. CHEVALLIER.

The paper presented by M. Lassaigne to the *Société de Chimie Médicale* notices new experiments to be made on this subject. Indeed, it would be of the greatest importance to discover the presence of oxide of lead in the tissues of subjects who have died through working in white lead manufactories. We have already made some experiments on this subject, but without success. However, M. Tanquerel Desplanches, who is occupied with the diseases caused by lead and its compounds, has shown that the skin of invalids submitted to hydro-sulphuretted baths, acquires a black tint, which would indicate the presence of a compound of lead in the tissues. These experiments are so much the more useful, as from our own investigations it appears that every year workmen attacked with lead colic die of that malady. If hospital statistics be consulted, it will be seen that 47 men working in lead compounds died during the years 1833, 1834, 1835, 1836, and 1839. These investigations might also be carried on with the view of discovering a new kind of treatment, more efficacious than those hitherto proposed.

EXPERIMENTS ON POISONING BY ARSENIC.†

BY M. ORFILA.

M. Orfila described to the Royal Academy of Medicine at its sitting of the 17th of March, two experiments which he has lately tried: 1st. A dog was poisoned with twelve grains of arsenious acid; he died at the expiration of twelve hours and a half: the urine did not contain an atom of poison; but the different organs contained a great deal. 2nd. Another dog was poisoned with two grains of the same substance placed in the cellular tissue of the thigh: he died in about thirty-six hours: the urine yielded some, and the viscera contained a prodigious quantity of it.

EXPERIMENTS ON THE ACTION OF TOBACCO ON ANIMALS POISONED BY ARSENIOUS ACID.‡

BY SIGNOR FLORIO.

Having ascertained by numerous experiments that a grain and a quarter of arsenic, or 24 grains of tobacco leaves were sufficient to kill a rabbit, Signor Florio administered to four rabbits of the same age, a grain and a quarter of arsenic each, and at the same time 3, 6, 12 and 24 grains of tobacco leaves. Now, he remarked that these animals, who had thus taken a double poison, died so much the quicker as the superadded quantity of tobacco was more considerable, so that he feels himself warranted in concluding that tobacco is not, as has been supposed, an antidote for arsenic; but that its action on the animal economy is similar. However, he would have obtained more accurate results if he had administered the tobacco at a later period, when the symptoms of poisoning first manifested themselves.

We may add that as one poison superadded to another, does not arrest its effects, but, indeed, hastens death, it cannot be definitively concluded that its action is the same. This remark applies not only to the case in point, but to others which may occur very frequently in legal medicine.

HYDRATED PEROXIDE OF IRON AN ANTIDOTE FOR SCHEELE'S GREEN.§

BY DR. SPAETR.

The following observation of a case wherein hydrated peroxide of iron has been successfully employed as an antidote for arsenite of copper is very important:—

A. B., aged three years, son of a landscape painter, licked a shell containing Scheele's green. In about half an hour, the child, generally thriving, had a pale and discomposed countenance; his mouth was smeared with a green colour; his tongue also was green. He had violent vomitings, diarrhœa, and excruciating pains in the lower part of the stomach. He uttered loud cries, held his abdomen squeezed with both hands, and ran about the room crying continually. He also complained of exces-

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[*] *Journal de Chimie Médicale*, April, 1840.

[†] *L'Experience.*

[‡] *Observatore Medico.*

[§] *L'Esculape.*

sive thirst. He was made to drink cold water, and a dose of fifteen grammes of hydrated peroxide of iron was prescribed, which he took at four times, in warm water. Scarcely had an hour passed after the exhibition of the antidote before the vomiting and diarrhœa ceased, as did also the pains and thirst.

Next morning all the symptoms of poisoning had disappeared, and, in a few days, the little patient was quite re-established.

FORMULA FOR HYDRATED PEROXIDE OF IRON, AS AN ANTIDOTE FOR ARSENIC.

BY MR. NEWBERRY, PRACTICAL CHEMIST, FETTER LANE.

℞ Purified sulphate of iron ..	1000 parts.
Sulphuric acid (sp. gr. 1·847)	200 do.
Water	4000 do.
Nitric acid, q. s.	

Dissolve the sulphate of iron in the water, and add the sulphuric acid: heat the mixture to ebullition, and add nitric acid in small quantities, until all disengagement of gas has ceased, and red fumes are no longer produced by the addition of acid; which indicates that all the iron has passed to the state of peroxide. Suffer it to cool, and add to the solution 20 or 30 times its weight of water; precipitate the iron by the addition of ammonia in excess; wash the red gelatinous precipitate in a large quantity of water, by decantation, until the washings are no longer rendered turbid by baryta water; place the product on a cloth, and allow it to dry at the ordinary temperature.

When employed as an antidote for arsenious acid, it should be administered in a gelatinous state, and should be kept so in the shops. It is so much the more certain in operation, as its preparation is recent.

ON RE-VACCINATIONS UNDERTAKEN IN VILLINGEN IN 1838.*

From 123 re-vaccinations which were performed, it appears that from the age of 11 to 20 years, the individuals vaccinated are susceptible of receiving the vaccine virus with a more or less complete success in the proportion of two-fifths. This susceptibility increases again between the ages of 21 and 30 years. Variolous epidemics show that, in general, vaccinated individuals, when they are seized with this malady before the age of 20 years experience it in only a slight degree, but as they advance in age, variola is more serious, and that aged subjects, although vaccinated, become quite as ill as those who have not been. It is to be remarked that in the epidemic which existed in Villingen in 1837-8, no re-vaccinated individuals were known to take variola or varioloid, although many subjects were vaccinated in the houses where variola was. This little operation is never attended by any inconvenience.

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* *Medicinische Annalen.*

TO CORRESPONDENTS.

Nota Bene.—*All Communications must be addressed, "To the Editor of The Chemist, care of Mr. Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be sent before the* 15*th of each month.*

We are greatly indebted to Mr. Coathupe for his valuable communication.

We thank Mr. Bartlett and Mr. Newberry for their communications.

A Subscriber.—Slaked lime, mixed in small quantities with the soil, which should afterwards be dried by exposure to the sun, or a gentle heat, will entirely remove all noxious effluvia.

A Chemist is informed that a perfect decomposition of the sulphates of baryta, lime, strontian, &c., cannot be effected by the means of which he speaks: sulphurets only of those earths are the result of such operations.

Mr. Smith.—Copaiba balsam may be mixed with distilled or soft water by means of mucilage or yolk of egg.

Mr. Wilson will find the method of making sweet nitre in The Chemist, No. III.—and that of preparing mint lozenges, in our present No.

W. M. L.—The method of separating the stearine from the elaine, in tallow, cocoanut oil, and palm oil, is as follows:—The tallow, or oil, is first melted and then left to cool to the point at which it assumes the granulated form: it is then put into strong canvas or horse-hair bags, and being placed upon the plate of a hydraulic press, a gentle pressure is at first made upon the bags: it is increased and continued until all the elaine has run out, which is known by its ceasing to flow, on additional pressure being made.

A Constant Subscriber, Leeds.—The omission was made for reasons given in No. III.

Mr. Thomas, Shaftesbury.—We considered, medically speaking, that the salts in question are not inert.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE NATURE OF THE ODOUR MANIFESTED IN CERTAIN CHEMICAL ACTIONS.

LETTER FROM M. SCHOENBEIN TO M. ARAGO.

The very interesting ideas which you published in the *Annuaire* for 1838, encourage me to acquaint you with the results of investigations which I have lately undertaken with the view of throwing some light on the nature of the odour called *electric*.

Some years ago I was struck with the perfect analogy existing between the odour which is developed when ordinary electricity passes from the points of a conductor to the surrounding air, and that which is disengaged when water is decomposed by a Voltaic current.

After having made many useless experiments in order to discover the connection existing between the two above mentioned phenomena, I arrived, not, indeed, at a complete solution of the problem, but at a point which may give an idea of the true cause of the electric odour. The facts which relate to the subject in question, are as follow:—

1. The smell of phosphorus, developed during the electrolization of water, is disengaged only at the positive electrode.

2. The disengagement of the odorous principle depends:—1st, on the chemical nature of the substance which serves for the positive electrode: 2nd, on the chemical constitution of the electrolytic fluid placed between the electrodes: 3rd, on the temperature of that fluid. As to the first condition, I have found that, of all the metals examined, gold and platinum alone permitted the disengagement of the peculiar odour. The more easily oxidizable metallic substances do not give the least trace of it. It is the same with carbon. With respect to the connection existing between the chemical constitution of electrolytic fluids and their faculty of disengaging the odoriferous principle, my experiments have shown as follows. The electric odour is developed at the positive electrode, when the fluid consists of distilled water mixed with sulphuric, phosphoric, or nitric acid, or potassa, or a variety of oxy-salts. The odour is not perceived when the water contains chlorides, bromides, iodides, fluorides, proto-sulphate of iron, or any substance having a great affinity for oxygen. Nor does the disengagement of the odoriferous principle take place if the first mentioned fluids are mixed with small quantities of proto-sulphate of iron, or nitrous acid, or with any substance the affinity of which for oxygen is very great. The fluids which develope the electric odour abundantly at a low temperature do not disengage any when heated to their boiling point. It sometimes happens that the odour is not manifested at all, although the circumstances under which the electrolization of the water is effected are such as might lead us to expect a contrary result. This most frequently occurs when the fluid employed is an aqueous solution of potassa. There are some reasons to believe that the disengagement of the odoriferous principle is impeded by impurities deposited on the surface of the positive electrode. According to my experiments, this principle may be obtained most abundantly by employing water as an electrolytic fluid, mixed with a sixth part of sulphuric acid.

3. The odoriferous substance disengaged at the positive electrode may be confined and kept in well-corked flasks.

4. When a small quantity of charcoal, or filings of iron, zinc, tin, lead, bismuth, arsenic or antimony, or a few drops of mercury, or nitric acid, or of a solution of proto-sulphate of iron, or protochloride of tin or iron, is put into a flask which contains the odoriferous principle (mixed with oxygen), the electric odour is almost instantaneously destroyed. Gold and platinum produce the same effect at a high temperature.

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* *Compte Rendu de l'Academie des Sciences*, No. 18.

5. When we immerse, for some moments, in a flask which contains the odoriferous principle (mixed with oxygen), a plate of gold or platinum whose surface is very dry, well scoured and cold, this plate becomes electronegative; that is to say, it acquires the faculty of producing a current to which it serves as a negative electrode. In other terms, a plate of platinum treated in the above-mentioned manner, constitutes, with a similar piece of the same metal in its ordinary state, a voltaic element. This element is such, that the current which it produces goes from the platinum through the liquid to the plate modified by the odoriferous principle. I call the extraordinary state of this plate, *negative polarity*. Easily oxidizable metals are not polarized negatively under the circumstances which I have just mentioned. Five years ago I demonstrated that the precious metals acquire negative polarity, when plunged for a short time into an atmosphere of chlorine or bromine.

6. The state of negative polarity is not developed either in gold, or in platinum, or in any metal whatever, when these bodies are immersed in a flask in which the electric odour has been destroyed by the above-mentioned means.

7. The negative polarity of platinum is destroyed, when it is suspended for a few moments in an atmosphere of hydrogen. Platinum, negatively polarised by the influence of chlorine or bromine, resumes its ordinary state when it is put into hydrogen. The same result may also be obtained by heating polarised metals to redness.

PHENOMENA OF POLARISATION AND ODOUR CAUSED BY ORDINARY ELECTRICITY.

8. When a plate of platinum or gold, the surface of which is very dry, well scoured, and cold, and which communicates with the earth, is exposed for some moments to the action of ordinary electricity arising from a metallic point attached to the first conductor, and when this exposure is effected in such a manner, that the surface of the plate receives, at a convenient distance, the electric "aigrette," the gold or platinum assumes negative polarity. This peculiar condition is destroyed, when these metals are submitted to the action of hydrogen or heat.

9. Gold or platinum, being attached to the first conductor, that is to say, acting as points of emission, do not acquire negative polarity, although electricity passes off very powerfully.

10. Easily oxidizable metals cannot be polarized by ordinary electricity.

11. The electric "aigrettes" lose their polarizing power as well as their phosphorous smell, when the points from which they proceed are wrapped in a piece of linen impregnated with distilled water, or saline, or acid solutions. The same effect may be obtained by strongly heating the points of emission of the first conductor.

There are other facts relative to the phenomena of voltaic polarization, but I shall not speak of them now, because a memoir, in which I have given all the observations I have made on this subject, will very soon appear in the *Bibliotheque Universelle.*

Before finishing my letter, permit me to draw some conclusions from the facts which I have just related.

1. The phosphorous odour disengaged during the electrolization of the water, is owing to the same gaseous substance which is developed near the metallic points from which the ordinary electricity, whether positive or negative, proceeds.

2. As to its voltaic action, this odoriferous principle is absolutely similar to chlorine and bromine. With respect to chemical properties, there exists a great analogy between the odoriferous substance and the bodies which I have just mentioned.

3. The odoriferous principle is chemically combined with hydrogen, and in this state of combination, it is diffused, either in water, or in the atmosphere.

4. This compound is an electrolytic body.

5. The electric odour is manifested when this body is electrolyzed and its electronegative element set free.

6. As the electric "aigrettes," like lightning, constitute a true current, and as the compound of which I have just spoken is spread in the air, the odoriferous principle must be disengaged every time that sparks and lightning traverse the atmosphere, that is to say, a peculiar odour must be developed. I have observed that the odour of this principle is pungent when the latter is concentrated, and that it much resembles that of phosphorus, when the substance is much diluted with air. This circumstance perfectly explains the differences of opinion concerning the smell produced by lightning.

Being almost sure that the odoriferous principle should be ranked in the class of bodies to which chlorine and bromine belong, that is, among elementary and hologeneous substances, I propose to give it the name of *ozone.* As I am convinced that this body is always disengaged in the air, and in perceptible quantity, in stormy weather, I intend to make a series of experiments in the course of this year for the purpose of showing the presence of ozone in the atmosphere. With this view, I shall place plates of platinum in very elevated places, taking care to make them communicate with the earth. This metal acquiring negative polarity by the action of the odoriferous principle, it may be concluded that ozone is developed, whence the platinum is found to be negatively polarized. I consider this kind of meteorological experiments sufficiently interesting to be undertaken every where, and I dare engage you to make similar observations at the Observatory, with the view of proving the negative polarity assumed by platinum under the influence of ozone. I make use of a galvanometer, the wire of which forms 2000 turns, and whose magnetic needle is astatic.

I cannot conclude my observations without saying that I am indebted, for many of the results of which I have spoken, to Mr. Grove's truly admirable pile, namely, a pile of very small dimensions, and which, however, gave me 15 cubic inches of detonating gas per minute.

ON THE COMPOSITION OF CRYSTALLIZED PHOSPHORIC ACID.*

BY M. PELIGOT.

THE interest which has attached to facts concerning phosphoric acid and the phosphates, since Mr. Graham's investigations, has induced me to undertake researches, with the view of completing our knowledge concerning the combinations of water with phosphoric acid.

The facility with which Mr. Graham has explained the alterations in their properties which this acid and its salts undergo by calcination, is well known: this chemist has proved that phosphoric acid forms salts in which water supplies the place of a true base, susceptible of being replaced by a mineral base in equivalent quantity, by double decomposition; and, in considering that this acid, separated from those classes of salts which were formerly called phosphates, metaphosphates and pyro-phosphates, still retained, at least for some time, the original properties which it possesses in its combinations with bases, Mr. Graham has admitted that phosphoric acid may combine with water in three different proportions, forming a phosphate of water (PhO^5, HO), a biphosphate (PhO^5, 2 HO) and a triphosphate (PhO^5, 3 H O).

But the existence of these compounds has hitherto been considered hypothetical, with the exception of the first, which appears to be vitreous phosphoric acid. We know how difficult it is to obtain phosphoric acid in the crystallized state: for this reason, its analysis, in this state, has never been attempted, or, at least, it has never been published.

I have endeavoured to fill up the gap which the history of phosphoric acid thus presents, by analysing crystals formed spontaneously in flasks containing phosphoric acid in the syrupy state.

One of these flasks exhibited two perfectly distinct crystalline layers: one occupied the lower part of the vessel and was separated by a very thick layer of syrupy phosphoric acid: these two crystallizations seemed to be of different formation and age; the upper crystals were transparent and hard; the lower ones were soft, and had the appearance of sugar of honey. These crystals, separately detached, were dried *in vacuo*, by placing them on porcelain plates; the dosing with water was effected by calcining them with oxide of lead.

According to my analysis, the upper crystals contained from 27 to 28 per cent. of water; and the crystals which adhered to the bottom of the flask, from 22 to 23.

The excessive avidity of these crystals for water renders a very accurate analysis very difficult, if not impossible; however, according to theory, hydrated phosphoric acid with three equivalents should contain 27·4 of water; and that with two equivalents, 20·1 per cent.

It is probable, therefore, that the upper crystals are formed by the hydrate with three equivalents, and the lower ones by that with two equivalents: besides, the properties of the products which I have analyzed justify this conclusion; for acid which lost 27 per cent. of water, saturated with ammonia, caused a yellow precipitate in nitrate of silver: the other acid forms a white precipitate with the same reagents. It is well known that these characters belong, or ought to do so, to the two hydrates under consideration.

In conclusion, the analyses detailed in my Memoir realise Mr. Graham's expectations concerning the existence of three hydrates formed by phosphoric acid; though the results which I have obtained are not so clear as could be wished, I have thought it my duty to publish them.

OBSERVATIONS CONCERNING ATMOSPHERIC ELECTRICITY.†

BY M. PELTIER.

The instruments used for measuring electricity indicate only the electrical differences of the bodies put in contact, and not the absolute quantity contained in one of them. This defect is a serious inconvenience in meteorological observations, since the instrument may be subjected to a powerfully electric atmosphere without giving any indication. To this defect, which is common to two kinds of electrometer, the multiplier joins great inferiority in sensibility, as I have shown in a memoir published in the *Annales de Chimie et de Physique*, vol. lxvii. I proved that the best multiplier required 7069 degrees of static electricity to cause a dynamic deviation of one degree. These two defects of the multiplier, have rendered this apparatus insufficient for studying atmospheric electricity in clear weather, taking for extreme points, the ground on one part and the atmosphere, at the height of a house, for the other. The multiplier likewise serves only for the indication of the electricity of stormy clouds.

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* *Compte Rendu de L'Académie des Sciences*, No. 18.

† *Compte Rendu de l' Academie des Sciences*, No 18.

I desired to resume this question and to examine the atmosphere at greater heights: experiments were made in an elevated plain three leagues from Corbeil, in M. Bregnet's grounds, where I found all the assistance I could desire, in instruments, knowledge, and devotion to science. Professor Guttierez took an active part in our investigations.

On the 21st of April, the sky was very clear; however, vapours forming long *cirri* connected distant *strati*, and advanced slowly into space. The air gave weak electric signs at three metres from the ground; the lower wind was north-west, while at the height of the clouds it was southerly. Towards noon, we sent up a kite attached to a copper wire 400 metres long: the wheel around which the wire was rolled had a counter; all the apparatus might be isolated if required. A multiplier of 3000 turns communicated with the wire by one of its extremities, and with the ground by the other: an electroscope could control the indications of the multiplier.

The kite arrived at a height of 30 metres, whilst the multiplier had not given any sign of a current, and whilst the electroscope had indicated a positive and increasing tension. From 30 to 50 metres, the multiplier deviated from 2 to 3 degrees, and indicated a positive descending current. Above this height, the multiplier and electroscope indicated a neutral zone; we then had a negative descending current of 2 or 3 degrees. The electroscope gave at this negative zone a thickness of about 20 metres, above which we again found the atmosphere positive. The new positive current was feeble at first; but when the kite rose to 120 metres, the needle began to proceed rapidly; when it arrived at 180 metres, the current gave 60 degrees, corresponding to 160 proportional degrees.

This subversion was too curious a fact not to attract our attention: we examined the atmosphere again next day and some days following: in the days following, this first experiment had an uniform serenity, which did not present any subversion of sign: the atmosphere was positive from 2 metres above the ground; the tension increased until 30 or 40 metres, at which height the quantity of electricity becomes sufficient to act on the needle of the multiplier. From 40 to 100 metres of elevation, the needle rose feebly, but from that height it proceeded rapidly; and the kite having once risen to 247 metres, the needle struck the stay at 90 degrees, and was maintained at between 70 and 80, which gave a current of at least 600 proportional degrees.

The uniform fact, which we found during those fine and dry days, was that electricity increased slowly until 100 metres; but that above that it increased rapidly until the greatest height we could attain. The needle was not tranquil in its deviation: it varied much, according to the changes and power of the wind. It was principally when the head of the kite was agitated, that the variations of the needle were most extensive: at this time it often described an arch of from 10 to 25 degrees, corresponding to from 30 to 80 proportional degrees.

ON LIQUID STORAX.*

BY E. SIMON.

In the *Journal de Pharmacie* for June 1831, M. Bonastre published the results of his investigations concerning a liquid storax procured from America; although the description he gives of the exterior aspect of this substance does not completely coincide with that of the storax of commerce, M. Simon thinks he may conclude from the similarity of the results obtained by M. Bonastre and himself, that this storax differs from that of commerce only by its recent state and greater purity. M. Simon has resumed M. Bonastre's work, and has enriched the history of some of the immediate principles of liquid storax with many new facts.

It was long thought that its acid was benzoic acid; but when the excellent works of MM. Plantamour and Frémy had discovered the existence of cinnamic acid in the balsams of Peru and Tolu, M. Liebig raised some doubts on this subject, and presumed, on account of the resemblance of storax to those balsams, that its acid also was cinnamic acid. This conjecture is verified by M. Simon's experiments. By distilling the acid procured from storax with nitric acid, he obtained essential oil of bitter almonds. The composition of the salts of silver studied by M. Marchand, who has undertaken the analytical part of M. Simon's work, tends still farther to confirm the correctness of this opinion.

The essential oil, obtained by distilling liquid storax with water and carbonate of soda, which does not seem to make it undergo any alteration, is limpid: it presents the very agreeable smell which is peculiar to storax, and bears some resemblance to that of pure napthaline: it is soluble in alcohol and in ether, and refracts the luminous rays like creosote.

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* *Annalen der Pharmacie*, vol. xxxi.

After some months it becomes thickened into a transparent, gelatinous mass, as viscous as a solution of caoutchouc. In this state it has lost its solubility in ether and alcohol, and essence of turpentine dissolves but a few traces of it. After the volatilization of the solvent, an uncrystallizable gelatinous mass remains.

If essential oil of storax be distilled in a bath of chloride of zinc, a portion of it passes to the state of a very fluid oil, the quantity of which is greater as the essential oil is more recent; the inverse occurs with the residue in the retort.

The volatile part, for which M. Simon proposes the name of *styrole*, is formed, according to several analyses, of equal atoms of carbon and hydrogen, or of

Carbon	92·46
Hydrogen	7·54
	100·00

consequently, it is isomeric with benzine.

The name best adapted for the solid residue, would be that of oxide of styrole.

If the essential oil of storax be distilled with nitric acid, it becomes brown and resinous: when this alteration is complete, the excess of acid is decanted off, and the resin is purified by washing: afterwards, when submitted to distillation with water, there passes over with the resinous vapours, a volatile oil, which has an extremely distinct smell of cinnamon, but, indeed, much stronger. When applied to the skin, it occasions a smarting like the essential oil of mustard, and reddens it, causing as much pain as the latter. If the recipient be kept cold, this oil crystallizes in a very short time, and may be separated by filtration from the water, which dissolves only a few traces of it; if the crystals be then dried, and dissolved in alcohol, which preserves in them their acerbity, the crystals yielded by this solution are of much greater beauty. They have the aspect of rhomboidal prisms, under the form of five tables. Without having yet studied them, M. Simon thinks that the name of *nitro-styrole* should be given them. Their taste is very similar to that of nitro-benzine. Styrole is the only substance of the essential oil of storax which produces this matter: oxide of styrole does not in any way contribute to its formation. The other products of this decomposition are benzoic and hydrocyanic acids.

When the essential oil has been extracted from storax by distillation, there is found in the retort an alkaline solution of cinnamate of soda, and a great quantity of resinous matter. It is filtered; the cinnamic acid is precipitated by means of dilute sulphuric acid; it is dissolved in alcohol, and the solution is evaporated in the air, in order to obtain crystals. These crystals are large, white, brilliant, rhomboidal prisms of 79°, in the form of tables. The property possessed by this acid, of yielding oil of bitter almonds by distillation, has already been mentioned. Hydrocyanic acid may likewise be obtained by rectifying the product of the distillation over sea-salt. The other products of the distillation are benzoic acid, picro-nitric acid, and resin, which form the residue in the retort. If cinnamic acid be distilled with bichromate of potassa, and dilute sulphuric acid, pure hydroguret of benzöile is produced; distilled with three times its weight of slaked lime, it yields a light volatile oil, colorless after rectification, which resembles benzine in its preparation, and many of its properties; such, for instance, as its insolubility in water; and which might assume the analogous name of *cinnamomine*: it has also the same composition as benzine; but it is, however, a different body.

With fuming nitric acid, *nitro-cinnamomide* is formed, resembling nitro-benzide in taste and smell.

Cinnamic acid is not decomposed, when distilled with a concentrated solution of caustic soda.

The resinous mass remaining in the retort, after the separation of the basic cinnamate of soda, contains styracine, which was first discovered by M. Bonastre. This substance may be isolated by dissolving the resinous mass in 18 or 20 parts of boiling alcohol of 0·825, filtering and withdrawing, by distillation in the sand-bath, two-thirds of the alcohol employed, and exposing the residue to a low temperature. The styracine, precipitated after cooling, may be purified by repeated washings with cold alcohol, and by being dissolved in 6-8 parts of ether. The ether is driven off by distillation in a sand-bath; and the styracine remaining is then chemically pure.

This substance is soluble in 3 parts of boiling alcohol, of 0·825; and in 20 to 22 of the same alcohol cold. Water, even when boiling, dissolves scarcely a trace of it. It fuses into an oleaginous liquid, which solidifies, without presenting a crystalline texture. It melts even at 40° Reaumur. Its best solvent is sulphuric ether, of which it requires scarcely 3 parts at the ordinary temperature; however, the alcoholic solution gives the finest crystals, because the evaporation is slower. It is neither acid, nor alkaline; it does not contain azote: and is especially distinguished from cinnamic acid, by its action with the alkalies, by its easy crystallization, &c.: for the rest, many of the principal properties of these two substances, are common to both.

When distilled with nitric acid, styracine does not produce essential oil of bitter almonds: but the product of the distillation, when rectified, contains also hydrocyanic acid, as with cinnamic acid. There are also found in the residue of the retort, the same products as with the latter acid; namely, benzoic acid, picro-nitric acid, and resin. It gives also hydroguret of benzoïle, by being distilled with bi-chromate of potassa and sulphuric acid. M. Simon observes, on this subject, that the styracine employed in these experiments, was perfectly free from cinnamic acid.

When distilled with hydrate of lime, it yields an essential oil, like cinnamic acid. The composition in hundredths of the latter, is also the same as that of benzine: but it appears essentially different from it, as also from cinnamomine.

If styracine be distilled with a strong solution of caustic soda, it acts in a totally different manner from cinnamic acid. Whilst the latter acid does not undergo any decomposition by the caustic alkalies, styracine gives rise to a heavy volatile oil, which passes over with the steam, and which differs from cinnamomine in its specific gravity, (it is much heavier than water,) in the oxygen which it contains, in its boiling point being much higher (it boils at 220° R.), and in its great solubility in water, (it dissolves in 30 parts of boiling, and in 90-100 of cold water,) its odour and taste do not in the least resemble those of cinnamomine: it has an exceedingly agreeable odour, similar to that of a mixture of essence of roses, bitter almonds, and cinnamon. M. Simon proposes the name of *styraçone* for this substance. Its elementary analysis is not yet completed. The residue in the retort, in this decomposition of styracine, is formed of basic cinnamate of soda, and resin. The cinnamic acid procured from it, is very pure. It crystallizes in rhomboidal prisms of 146°; and although its crystallization differs from that of cinnamic acid extracted from storax, M. Marchand has discovered in them an identity of crystallization.

From the preceding, it results that styracine is decomposed by the caustic alkalies into styraçone, cinnamic acid, and resin; and it is for this reason that we should not extract cinnamic acid from storax, by means of caustic alkalies, if we wish to procure styracine from it. A solution of carbonated alkalies must always be used, as they do not decompose styracine, even when in the greatest state of concentration, and at a boiling heat.

Styracine has no capacity of saturation; however, acids augment its solubility, as is observed with cinnamic, crystallized acetic, and sulphuric acids, &c.

The elementary analysis of styracine, gives:—

24 C = 84·47
22 H = 6·32
2 O = 9·21
———
100·00

After the separation of the substances which we have just studed, there remains a hard and a soft resin, soluble partly in ether, and partly in alcohol, which do not present anything worthy of interest.

DECREPITATING SALT OF WIELICZKA.[*]

At the sitting of the Academy of Sciences of Berlin, on the 14th of October, 1839, M. Rose read a paper on this remarkable salt, which is distinguished from ordinary decrepitating sea-salt, by its decrepitating not only in the fire, but even when dissolved in water. As it dissolves in that liquid, there are disengaged with noise bubbles of a gas which is evidently compressed in the salt, and which is the cause of this decrepitation. M. Dumas analysed a very small quantity of this gas; it seemed to him to be formed of hydrogen and carbon. M. Rose, in examining this gas *de novo*, ascertained that its volume was about half that of the salt, that it had nearly the same composition as marsh gas; and that probably it was compressed in the salt, to the point at which it assumes the liquid, or even the solid form.

This decrepitating salt deserves peculiar attention; considering that many minerals decrepitate like it by heat without disengaging the slightest trace of humidity. It is probable that this phenomenon also is owing to the expansion of a gas, which is confined in the interior of these minerals, under a considerable pressure.

ON QUININE.[†]

BY M. H. MAGONTY.

An accidental circumstance led M. Magonty to study the influence of the ammoniacal salts on the manner in which quinine acts when treated at different degrees of temperature Thinking, with him, that every thing relating to this alkaloid is highly interesting, we give the conclusions which he has himself drawn from his observations:—

1st. Quinine is more soluble in water

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[*] *Journal de L'Institut.*

[†] *Journal de Chimie Medicale*, May 1840.

than has been supposed, and its solution is assisted by heat:

2nd. It is dishydrated in the midst of water at 60°:

3rd. Quinine may easily be crystallized with the assistance of water, whilst alcohol effects this result but very difficultly:

4th. Ammonia, without heat, decomposes the salts of quinine only very partially, as is the case with the salts of magnesia, and, the ammoniacal salts are decomposed by quinine by boiling in water.*

EXAMINATION OF THE BARKS OF THE TRUE AND FALSE ANGUSTURA.†

BY M. GENEST.

Not finding in the authors who have written on this subject, any very well defined distinctive characters between the two angustura barks, I have repeated the experiments given in books, and I have also undertaken a series of new ones, in the endeavour to establish some striking differences. Although I cannot flatter myself with having attained my object, still every thing relating to the distinction of these two barks from one another is so important, that I think it my duty to publish the results which differ from those indicated in books, and which I think I have discovered, as well as the new re-actions presented in the experiments which I have made with this intention.

A drachm of each bark, in powder, was macerated in an ounce and a half of distilled water: the supernatant liquor, when filtered, presented the following phenomena:—

	TRUE.	FALSE.
Chloride of Barium	No precipitate	Much turbidness; afterwards a precipitate, which was not wholly re-dissolved in nitric acid.
Bichloride of Mercury	A re-action, agreeing with that indicated in the books	An abundant dirty white precipitate.
Emetic	The same	Instead of a white precipitate, I obtained but slight turbidness.
Perchloride of Iron	A very abundant reddish-brown precipitate	Dirty green.
This re-agent seemed to me to present a greater difference than the sulphate of the same base.		
Sulphuric Acid	It did not much affect the true, as it is said it should do. I obtained only a very slight turbidness.	

DECOCTION.

I boiled a drachm of each angustura bark in an ounce and a half of distilled water for ten minutes, and I remarked that the powder of the true acquired a greater bulk than that of the false; and that its decoction was more difficult to filter.

The decoction of the true angustura retained its colour and transparency, when kept for several days; whilst the false stained the sides of the vessel, and assumed a blackish brown colour.

	TRUE.	FALSE.
Chloride of Barium	Nothing	Turbidness.
Nitrate of Silver	An abundant yellowish precipitate	Nothing.
Sulphuric Acid	Yellow precipitate	Nothing.
Perchloride of Iron	Greyish precipitate	Deep green, without precipitation.
Caustic Potassa	Reddish-yellow coloration by refraction; and dirty green by reflection	Greenish tint. The liquor remained transparent.
Phosphate of Soda	Nothing	Nothing immediately; afterwards a deep brown coloration.

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* For an article on the action of ammonia on quinine, see *The Chemist*, No. IV. p. 111.

† *Journal de Chimie Médicale.*

ON THE PRESENCE OF COPPER IN VARIOUS NATURAL PRODUCTS, WITH PROCESSES FOR DETECTING IT.*

BY M. A. THIEULLEN.

The presence of native copper in various natural products, seems to be well demonstrated, and to be no longer doubtful; especially since the appearance of the recent works of MM. Devergie and Hervy, who have informed the Academy of Medicine that there exist, in the tissues of man and animals, small quantities of copper and lead.

This question has lately been again raised in Belgium, and two different opinions have been formed concerning it.

M. Rotermand is of opinion that it exists in all grains.

M. Koperynsch'y, who has just published a work on the adulteration of bread, thinks that this metal does not exist in bread; and he says that he has not found any trace of it in grain.

This subject is of the highest importance, especially when it is taken into consideration that small quantities of sulphate of copper have been introduced by some bakers into the dough, at the time of making it into bread, and that investigations are frequently made with the view of detecting the presence of copper arising from this salt.

This question is of still greater importance in Belgium, where the employment of sulphate of copper is at the present time the subject of legal investigations. Although this salt is no longer employed in France, thanks to the measures taken by Government, it is no less true that it would be useful to decide so serious a question, and that investigations should be undertaken by order of the authorities, by men whose names would be a guarantee, and give the force of law to the results of their experiments. This measure is so much the more urgent, as M. Rotermand is not the first who has detected the presence of native copper in organic products, as I shall show, by summing up in few words the experiments made on this subject, which I shall arrange in the order of their dates.

In 1828, M. Boudet informed the *Société de Pharmacie de Paris*, at its sitting of the 15th of March, that M. Vauquelin had announced to the Institute that M. Sarzeau had detected the presence of copper in a great number of vegetables.

M. Vauquelin had already found this metal in blood: but, as he had used a copper vessel, he attributed to this the copper which he detected in the ashes.

In 1830, M. Sarzeau published, in the *Journal de Pharmacie*, a work on the presence of copper in vegetables and blood.

In this work the author, being desirous of giving every one his due, sets forth, according to Berzélius, in his *Traité du Chalumeau*, published in 1821, page 7:—1st, that Gahn, long before it had been suspected that the ashes of vegetables contained copper, had several times extracted this metal from the ashes of different kinds of paper:—2nd, that Vauquelin, in analysing a plant, had found copper in it, in a more conclusive manner:—3rd, that the discovery of copper in vegetables, belongs to Meissuer, who detected it in a great number of exotic and indigenous plants. The following is the process which he adopted, and which is published in Schweigger, Vol. xvii. pp. 340 and 436. The plant is incinerated, and the ashes are washed with distilled water, to remove the soluble salts: the residue is boiled with hydro-chloric acid, the solution is saturated with ammonia, so as to leave only a slight excess of acid; it is filtered, and a plate of iron or zinc is steeped in the liquid, and assumes a cupreous appearance, at the expiration of a day or two.

According to these different experiments, M. Serzeau thus shows the quantities of copper which he has obtained from the undermentioned substances:— [copper.

500 gr.	of grey quinquina yielded	2	milligr of
,, ,,	of Madder . .	2	,,
,, ,,	of green Martinico coffee	4	,,
,, ,,	of yellow Bourbon coffee	4	,,
256 ,,	of Coffee grounds .	3	,,
1½ kilog.	of Wheat incinerated	7	,,
1½ ,,	of fine Flour . .	1	,,
1 ,,	of Blood taken cold .	1	,,

M. Sarzeau also said that he found copper in bran, tea, rice, sarazin, rye, barley, corn, and in the bark of malambo. But, as he operated on too small quantities, he could not determine in what proportions.

This chemist concluded, from his experiments, that the annual consumption of flour in France represented 7,300,000,000 kilogrammes of wheat, containing 361,000,000 kilogrammes of copper.

M. Sarzeau also says that bran contains a greater quantity of copper than wheat and flour; but he was unable to ascertain the weight, on account of an accident which occurred during the operation.

M. S. has substituted another process for that of Meissner. It consists, 1st, in washing the ashes in water, in order to remove the soluble salts: 2nd, in treating with hydrochloric acid, in saturating the solution by an excess of ammonia, and in filtering the liquor: 3rd, in precipitating the copper by prussiate of potassa: 4th, in decomposing the prussiate thus obtained, by the action of heat, and in treating the residue by weak sulphuric acid, in order to convert it into a sulphate: 5th, in decomposing this sulphate by a sheet of iron. He says that it is necessary to operate on one pound at least.

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* *Journal de Chimie Médicale*, May 1840.

After giving the means by which he obtained these results, M. Sarzeau says positively :—

"Chemists, called upon to give an opinion in cases of poisoning, will thus find it necessary to be on their guard, when, in examining very large quantities of animal matter, they find only traces of copper : I say traces; for I do not think that there exists more than a milligramme of copper in a kilogramme of blood taken cold."

In 1832, Piétro Perréti, professor of Chemistry and Pharmacy at Rome, published a work on the presence of copper in wine.* He gave means of detecting this metal, and distinguishing when it exists in it naturally, and when it has been introduced into it.

In 1833, M. Boutigny published a work entitled : *On the presence of copper in corn and many other substances.* He sums up the results of his experiments as follows :—

1st, Food or broth prepared in copper vessels, almost always contains copper, more or less, which is a great objection to the uses of that metal for culinary purposes :

2nd, Wine, cider, and corn sometimes contain copper, but only when the ground in which the vines, apple-trees, and corn grow, contains it ; which allows us to affirm that the presence of copper in vegetables, does not result from the act of vegetation, but from absorption.

3rd, The detection of copper in food and drinks, raises a medico-legal question, which causes a necessity for fresh investigations ; and this should render juries very circumspect in cases of poisoning by copper.

In 1837, M. Bouchardat announced the presence of copper in muscles, and concludes by the following passage † :—

"From these facts, it results that muscles may naturally contain a sufficient quantity of copper to produce poisoning.

"M. Bouchardat refers the presence of this copper to the muscles having been collected from the sheathing of ships. He says he obtained this metal by the process recommended by M. Sarzeau.

M. Bouchardat's opinion, which refers the poisonous action of muscles to the copper which they contain, has been contested by M. Orfila.‡ The following is what he says on this subject :—

"As to cupreous preparations, how can their introduction into the bodies of these molluscæ be conceived ? Doubtless, after their solution in water. Now, the analyses of sea-water, made in various places, have never demonstrated the existence of an atom of copper : besides, would not these animals be killed by swallowing a cupreous preparation ?"

From what we have above explained, it would seem that the existence of copper in the native state in various substances is well demonstrated : we also think that the recent publications of M. Orfila may permit greater rapidity of operation, by treating flour or bread with pure nitric acid, obtaining a *nitric carbon*, treating it with distilled water, filtering, passing a current of hydrosulphuric acid through the filtered liquor, collecting the precipitate, converting it into a sulphate and using the sheet of iron. The carbon may be incinerated in order to ascertain whether any copper remains in it, which is not probable.

ON NEW COMBINATIONS OF CHLORIDES, BROMIDES, AND SULPHURETS OF NAPTHALINE.

BY M. A. LAURENT.

In this memoir M. Laurent describes :—

1st. Hydrochlorate of chloro-napthalise, which crystallizes in fine prisms with a rectangular base. By distillation and by potassa it loses hydrochloric acid, and pure chloro-napthalise is obtained.

Its formula is $C^{40} H^{10} Cl^{6} + H^{4} Cl^{4}$.

It is prepared with chlorine and hydrochlorate of chloro-napthalise.

2nd. An oily hydro-chlorate, isomeric with the preceding, and a sub-hydro-chlorate, equally oily, whose formula is $C^{40} H^{10} Cl^{6} + H^{2} Cl^{2}$.

3rd. Crystallized hydro-bromate of bromo-napthalose, decomposable by distillation and potassa, which deprive it of hydro-bromic acid.

Its formula is $C^{40} H^{8} Br^{8} + H^{4} Br^{4}$.

It is formed by exposing bromine and bromo-napthalose to the sun.

4th. Broma-napthalose, which crystallizes in needles. It is not alterable by potassa and distillation.

Its formula is $C^{40} H^{8} Br^{8}$.

It is prepared by distilling No. 3.

5th. Sub-hydro-bromate of bromo-napthalose, crystallized in needles. Potassa and distillation decompose it.

Its formula is $C^{40} H^{8} Br^{8} + H^{2} Br^{2}$.

It is prepared in the same manner as No. 3, and is found mixed with it.

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* M. Sarzeau says that copper, or sulphate of copper which had been added to bread, may be detected by the blow-pipe, which is not the case with the copper which forms a constituent part of corn or flour.

† Vide *Annales d'Hygiéne*, Vol. xvii. p. 358.

‡ In his *Toxicologie*, vol. ii. p. 42.

6th. Crystallized chloro-bromo-napthalise, not decomposable by potassa and distillation.

Its formula is $C^{40}\ H^{10}\ Cl^{4}\ Br^{2}$.

It is prepared by para-chlora-naphthalese and bromine. Its formation proves that chloro-napthalese and the para-chloride are really two different bodies.

7th. Crystallized chloro-bromo-napthaléise.

Its formula is $C^{40}\ H^{10}\ Cl^{4}\ Br$.

It is not decomposable by potassa and distillation.

8th. The most important part of this Memoir is that which concerns the action that potassa and distillation exercise on a compound which I have called hydro-bromate of chloro-bromo-napthalose. It proves that I was completely wrong in saying, formerly, that, *Experiments and the theory of substitutions ought to show us the nature of these compounds.*

Experiment only has decided, and it has just proved that the theory of substitutions has nothing to do with the question. Indeed by distilling hydro-bromate of chloro-bromo-napthalose, it loses its bromine in the state of a simple body, and not of hydro-bromic acid.

Potassa removes one part of the bromine in the state of bromine, and one part in the state of an hydracid.

Moreover, if I formerly said that compounds of napthaline contributed to support the theory of substitutions, it was because I believed that the twelve or fifteen compounds of chlorine and bromine, to which it gives rise were converted by the chlorine into chloro-napthalose. I have just ascertained again that this reaction never occurs, and that chloro-napthalose and chloro-napthalise are only products of destruction by heat.

9th. Sulpho-chloro-napthaline is an uncrystallizable, pulverulent body.

Its formula appears to be $C^{40}H^{12}Cl^{4}+S^{2}+H^{8}O^{4}$.

It is prepared with hydro-sulphate of ammonia and hydro-chlorate of chloro-napthalise.

INVESTIGATIONS CONCERNING THE QUANTITIES OF HEAT DISENGAGED IN CHEMICAL COMBINATIONS.*

LETTER FROM M. HESS TO M. ARAGO.

The complaisance with which you were kind enough to devote yourself to investigations among the papers of your late friend, M. Dulong, in consequence of a communication which I had the honor of making to you, induces me to hope that you will pardon me for troubling you again. You will have perceived by my first letter, that I am occupied with the same subject, and that M. Dulong had engaged me to await the publication of his investigations to continue my own. I have since resumed this work and I have ascertained that by operating in a certain manner, very uniform results may be obtained. It is the nature of these substances, that the greater the quantity of the substances employed for combustion, the more certain becomes the result. It certainly would be easy for you to find in M. Dulong's notes, the volumes of oxygen which he ordinarily employed. This, which cannot fail to be found among his papers, it would be very important to know. At all events, M. Cabart, who has given you much information relative to the apparatus for combustion which he made use of, will know where the gasometers are to be found, and what was their volume. Many of my results perfectly agree with those of M. Dulong. I shall publish them when they are complete, with all the details of the experiments and apparatus, seeing that these fundamental data require to be perfectly established: they are too expensive and tedious for one not to endeavour to render a repetition of them superfluous.

Permit me to communicate to you some results analogous to the subject of this letter, which, I hope, will deserve your attention. I had formerly found that, when two substances combine in several proportions, the quantities of heat disengaged by these different combinations are found to be in a simple and multiple relation. The importance of this fact, the enunciation of which I consider as a general law, compelled me to repeat these experiments with care: the following are the results of them. The heat disengaged is expressed by the quantity of water that one part of acid (always supposed to be anhydrous), raises from 1° centigrade.

Acid employed.	Water added.	Heat disengaged.	Multiples.
$\dddot{S}$	H	311·86	8
$\dot{H}\ \dddot{S}$	$\dot{H}$	77·86	2
$\dot{H}^{2}\dddot{S}$	H	38·9	1
$H^{3}\dddot{S}$	$3\dot{H}$	38·9	1
$\dot{H}^{6}\dddot{S}$	xH (excess of water.)	38.9	1

If, instead of acting directly, by producing the combination of water and sulphuric acid in fixed proportions, the acid (of the composition indicated in the table) be mixed with an excess of water, sufficient to disengage all the heat of the mixture of acid and water, the following numbers are obtained : —

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* *Compte Rendu de l' Academie des Sciences*, No. 19.

Acid employed.	Heat disengaged.	Multiples.	Differences.
$\dddot{S}$	513·96	13	8
$H\,\dddot{S}$	194·56	5	2
$H^2\dddot{S}$	116·7	3	1
$H^3\dddot{S}$	77·8	2	1
$H^6\dddot{S}$	38·9	1	

I intend to resume these experiments again hereafter with the view of arriving at the most accurate results possible: for the present, the most essential thing was certainly to discover a general relation which will allow us to interpret successfully the ulterior investigations. These investigations have led me to the following law : —

A combination having taken place, the quantity of heat disengaged is unvarying, whether the combination is effected directly, or indirectly and at several times.

If a base be saturated with sulphuric acid, it is found that strong acid disengages more heat than weak : but, let the quantity of heat disengaged by the weaker acid be added to that disengaged by the water, to bring it to that state of dilation and an uniform number will be obtained.

Acid employed.	Heat disengaged. By Ammonia.	By Water.	Total.
$H\,\dddot{S}$	595·8		595·8
$H^2\dddot{S}$	518·9	77	596·7
$H^3\dddot{S}$	480 5	116	597·2
$H^6\dddot{S}$	446·2	155·6	601·8
		Mean	597·8

I add the cyphers furnished by potassa, which were the most difficult to verify.

Acid employed.	Heat disengaged. By Potassa.	By Water.	Total.
$H\,\dddot{S}$	597·2		597·2
$H^2\dddot{S}$	527·1	77·8	604·9
$H^3\dddot{S}$	483 4	116·7	600·1
$H^6\dddot{S}$	445·4	133·6	601·8
		Mean	601

Similar results are obtained with soda and lime : all these bases, with sulphuric acid, disengage the same quantity of heat. This leads me to speak of thermo-neutrality ; but as I cannot do so without exceeding the limits of this letter, I reserve this subject for another time.

If the laws of multiple proportions be applied to M. Dulong's investigations, it will be perceived that the heat disengaged by the combustion of the neutral carbon is governed by this law, and it is found that in the formation of carbonic acid, the quantity disengaged by the first atom of oxygen, is to the quantity disengaged by the second as 3 : 2. There is a similar relation between the two oxides of copper. Let us apply this to the combustion of coal in high furnaces, and we shall find, that two atoms of oxygen, employed to produce oxide of carbon, disengage 6° of heat; while they would disengage but 5° if they were employed to produce carbonic acid. It may be asked why oxide of iron, mixed with charcoal and strongly heated, does not continue to operate the combustion of the charcoal, and was not reduced to iron. Let us admit, for the heat disengaged by the oxygen combined with the iron, a similar proportion as for the charcoal, and we shall find that if the peroxide of iron is $2\dot{F}e+O$, the whole heat, disengaged by the three atoms of oxygen, will be 8°, whilst these three atoms employed to produce the protoxide, would have disengaged 9° of heat. They contain, therefore, no more than $\frac{1}{9}$ of disposable heat, which would appear to be insufficient for keeping the mixture at the required temperature. The result is not conclusive in this case, because the number of atoms of oxygen is very limited. But we will consider gunpowder, or a mixture of saltpetre and charcoal. Why does it burn so easily? We will suppose, with nitric acid, a series analagous to that which we have given above. Be the quantity of heat disengaged by the first atom of oxygen, 16°, by the second, 8, by the third, 4, by the fourth, 2, by the fifth, 1. The sum of heat disengaged would be 31°, whilst the whole heat would be 5×16, or 80. The combination contains the $\frac{5}{8}$ of disposable heat, which, if we take into consideration the heat corresponding to the excess of affinity of the carbon for oxygen over that of azote, sufficiently explains to us the heat disengaged by the combination of the mixture. One of the cases most frequently requiring explanation, is that of knowing if a combination of three atmospheres (such, for instance, as $\ddot{M}n$), is $R+2O$, or $RO+O$. In all chemical decompositions, the quantities of heat disengaged are commonly neglected. For example, we think that the preparation of oxygen is sufficiently explained to us by the following equation : $\ddot{M}n$ and $\dot{H}\,\dddot{S}=\dot{M}n\,\dddot{S}+\dot{H}$ and O and H. If these formulæ were the exact translation of the phenomenon, the heat necessary to produce decomposition would be uniform from the beginning to the end of the operation : but it is not so. The experiment has only to be made with a spirit-lamp, which allows of the heat being well regulated, and it will be found that the operation is divided into two very distinct periods. The formulæ $2\,\ddot{M}n$ and $3\,\dot{H}\,\dot{S}=\dot{M}n\,\dddot{S}+\dot{H}$ and O and $2\,\dot{H}$ are first obtained: that is to say, but one-fourth of the oxygen of the peroxide ($\ddot{M}n$) is disengaged. If the heat be then very considerably augmented, exactly the same quantity of oxygen is obtained as at the first time, more hydrated sulphuric acid, and you have, finally, $\dot{M}n\,\dddot{S}^3+H=2\,\dot{M}n\,\dot{S}$ and H S.

The second law mentioned above, conducts us to no less interesting results. In *The Athenæum*, No. 620, Dr. Ure published some investigations on the quantity of heat disengaged by various kinds of pit-coal. From these experiments he draws the conclusion that the present method, which consists in measuring the useful effect of a combustible by the quantity of oxygen required for its combustion should be laid aside. Dr. Ure found that the more hydrogen pit-coal contained, the less heat it gave, which he attributed to the formation of vapours, which absorb a portion of the caloric. I appreciate this experiment so much the more, as the author, who did not know the cause of it, gives an evidently incorrect explanation, seeing that final combustion gives, foreign matters being abstracted, only gases. Now, it is thus: the sum of heat corresponding to a certain quantity of water and carbonic acid, which we suppose to result from combustion, being unvarying, it is evident that if hydrogen were previously combined with the carbon, this combination could not occur without disengagement of heat: this quantity being thus already eliminated, would no longer be found in the quantity disengaged by the final combustion. From this results the very simple practical rule *that a combustible compound always disengages less heat than its elements, taken separately*. A glance at M. Dulong's experiments will be sufficient to convince you that they coincide very well with this mode of interpretation. When we are better acquainted with the quantities of heat disengaged by the combination of several elements, the quantity of heat disengaged by the combustion of an organic substance will then become an important element, and one which will lead us to a more intimate knowledge of its constitution. I am fully convinced that we shall have a precise idea of chemical phenomena only when we are able to indicate in our formulæ the proportions of caloric as we now do the relative cyphers of ponderable atoms: at least, thermo-chemistry promises to unveil to us the yet hidden laws of affinity.

ON A NEW COMBINATION OF CHLORIDE OF PLATINUM AND AMMONIA, CONSIDERED AS THE RADICAL OF THE SALTS OF GROS.

BY M. JULES REISET.

Proto-chloride of platinum, treated by liquid ammonia, is rapidly converted into a very deep green matter, giving rise to a considerable elevation of temperature. This green powder, put on a filter and washed, resembles in all respects the green salt discovered by Magnus, the formula of which is $R\,Cl^2\,Az^2\,H^6$, and which has, like it, the property of giving, with nitric acid, the series of remarkable salts discovered by Gros.

If, instead of limiting the action of ammonia on proto-chloride of platinum to the production of Magnus's salt, it be boiled, taking care to replace the ammonia as fast as it evaporates, the green salt concludes by being completely dissolved, and the liquor evaporated in a suitable manner, gives, by cooling, a fine crystallization in needles. Magnus's salt, treated directly by ammonia, gives rise to the same crystals.

These crystals, which are soluble in water and ammonia, are precipitated by alcohol from their solutions. Heated in a tube, they disengage ammonia at a temperature approaching 250°; thick vapours of hydrochlorate of ammonia very soon condense on the sides of the vessel, and, towards the end of the calcination, it is easy to detect the presence of free hydro-chloric acid: the non-volatile residue is perfectly pure metallic platinum. Potassa, without heat, does not disengage ammonia; its presence is rendered evident only by long boiling with that re-agent. The analysis of this body induces me to give it the following formula:

$$Pt\,Cl^2\,Az^4\,H^{12}:$$

that is, one atom of proto-chloride of platinum combined with two atoms of ammonia.

If we return to the formula of the salts obtained by Gros, by acting with nitric acid on Magnus's green salt, it will be seen that the body which I have just described is a radical, which, when united with oxygen, acts as an energetic base, capable of saturating acids, and of producing with them the salts of Gros.

The general formula of the salts of Gros is represented by—

$$Pt\,Cl^2\,Az^4\,H^{12},\ O+A\,;$$

$Pt\,Cl^2\,Az^4\,H^{12}\,O$ being the base capable of saturating a quantity of any acid represented by A.

I was easily convinced that the body of which I speak acts as a radical. When treated by nitric acid, at a gentle heat, reddish vapours are disengaged, and the filtered liquor allowed a salt to crystallize which has the same composition as the nitric salt described by Gros, namely,

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* *Compte Rendu de l'Academie des Sciences;* June 1st, 1840.

$$Pt\,Cl^2\,Az^4\,H^{12}\,O,\ Az^2\,O^5.$$

The chloride of the radical, or the hydrochloric salt of Gros, is most easily obtained by passing a stream of chlorine gas into a solution of the body, the method of preparing which I have given above: this chloride being very little soluble in water, is precipitated under the form of a crystalline powder, the composition of which exactly corresponds to the hydro-chloric salt of Gros: its formula is $Pt\,Cl^2\,Az^4\,H^{12},\ Cl^2$: it is the chloride of the radical.

The existence of this radical, which Gros merely glimpsed at, and which I have been so fortunate as to discover, explains in the simplest manner, this series of interesting salts.

I shall endeavour to ascertain whether, under certain circumstances, perfectly neutral bi-chloride of platinum, yields combinations analogous to those formed by the proto-chloride.

I shall likewise return in greater detail to certain properties of the body whose existence I have just announced.

II. CHEMICAL MANUFACTURES.

ON THE PRESERVATION OF WOOD.*

BY M. A. BOUCHERIE.

The author, in the investigations which form the subject of this memoir, had the following objects in view:—

1st, To ensure the preservation of wood, by enabling it to resist at once the destructive effects of atmospheric agents, and the attacks of insects:

2nd, To give to the wood, when required, in a durable manner, elasticity or suppleness, equal or superior to that which it possessed in the recent state:

3rd, To prevent it from warping, when used:

4th, To diminish the inflammability and combustibility of wood used in building:

5th, To dye, in the mass, wood intended for cabinet making.

The nature of the substances employed, varies according to which of these objects it is intended to fulfil; but the process by which the matters that produce the desired effects, are made to penetrate to the interior parts of the wood, is always the same: it consists in the employment of the vital power of vegetables, which remains some time after they have been separated from their roots.

When M. Boucherie commenced the trials of his process, he was unacquainted with any work of a similar nature: since then, however, he has learned that experiments have been tried on herbaceous vegetables, and on young branches, with the view of ascertaining, by the absorption of coloured vegetable solutions, the direction which the sap follows in its course. These investigations were undertaken with a purely scientific object; and no one before him has ever had the idea of making use of the vital power of vegetables, and of converting it into a manufacturing power, by the assistance of which it would be possible to introduce into the whole mass of wood certain matters capable of effecting its preservation, and of endowing it with fresh properties.

The operation may be performed on a tree, whilst it is yet standing; for, by making a transversal section, by means of which the sap vessels are put in contact with the solution which it is desired they should absorb, it may be managed on two opposite points of the wood, that the trunk may retain its vertical position. This method of operating, diminishes the expense, renders the impregnation quicker, and is what M. Boucherie prefers, when circumstances permit. When the tree is completely separated from its stump, the aspiring power (*force aspiratrice*) diminishes from the moment at which it is cut down; but after two days, and perhaps even more, impregnation may again take place.

The aspiring power varies according to the time of year; but all kinds do not vary in the same manner. In general, however, autumn is the season in which it is most energetic.

The quantities of different liquors which a tree may absorb, are very considerable: but the absorption of neutral solutions is much more abundant, than that of acid or alkaline solutions.

The penetration, however, is never complete with ligneous vegetables. In white woods there is always found a central tube, of variable diameter, which resists impregnation. In hard woods, it is the most central parts of what is called the core, which retain their natural state. In the same species there are, in this respect, differences which are doubtless partly attributable to age, but which may also be owing to other causes, not yet thoroughly investigated.

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* *Compte Rendu de l'Académie des Sciences*, May 4, 1840.

Having discovered that autumn is the most favourable time of year for impregnation, the author enquires whether this season would not be also the most advantageous for cutting down trees which are to be subjected to preservative operations. Trees are generally cut down in winter, in the idea that having at that time less sap, they may be dried quicker and more completely. M. Boucherie considers this process as objectionable. He has ascertained, indeed, that when the vessels which contain the sap, divided by the cutting instrument, are not put in contact with a liquid, they do not the less exercise an absorbent action: but it is from the air which they let in, and in greater quantity, as the vegetable life is more active at that time.

Having measured, by means of a very simple apparatus, the volume of air absorbed by a branch, under the most favourable circumstances, he found that it was almost equal to that of the branch itself. He says that this air is evidently substituted for the water which is evaporated by the leaves, and its introduction into the interior of the wood cannot fail to hasten its desiccation. Such a fact as this, he adds, must convince us that autumn, and not winter, is the time for cutting down the trees, and that it is best not to allow the leaves to fall off first.

We have said that the substances which are caused to penetrate into the interior of wood, by means of the aspiring power, which, during the life of vegetables, regulates the ascending of the sap, varied according to circumstances: it now remains for us to make known the matters employed by the author, in the different cases enumerated above.

OF THE PRESERVATION OF WOOD.

M. Boucherie sets out from the principle that all the alterations which wood presents arise from soluble matters which it contains, and which cannot be completely removed, even by long-continued washings: his object, therefore, was to find chemical agents which would convert these matters into insoluble compounds.

Crude pyrolignite of iron, which is very cheap, seemed to him to answer the purpose in all respects, and its advantages have been confirmed by the results of various experiments, the details of which are given in his Memoir. We content ourselves with giving the following:—

Hoops of casks, made of chestnut wood, become rotten, as is well known, after having been a very short time in cellars: they present, therefore, a means of forming a comparison of the resistance of natural wood and prepared wood.

A commission was named by the prefect of Gironde, for pursuing experiments undertaken with this view: in his presence, in the month of December 1838, prepared hoops and hoops of commerce in their natural state, were placed upon the same casks; these casks, which were deposited in the dampest parts of a cellar, were visited on the 8th of August 1839: the hoops which had not been prepared by M. Boucherie's process were completely rotten, whilst the others had not undergone any appreciable alteration.

The employment of pyro-lignite of iron has the effect not only of preserving the wood from the destructive effects of the atmospheric agents, but also of rendering it more capable of resisting mechanical ones.

OF THE FLEXIBILITY AND ELASTICITY OF WOOD.

These qualities, says M. Boucherie, are particularly required by the navy; and wood which presents them and retains them longest, offers such guarantees of service and durability, that it does not hesitate to pay a very high price for it.

Although in many cases the organic constitution of wood, and, in certain circumstances, even its chemical composition, may contribute to preserve its suppleness and elasticity, still these properties are more intimately connected with the proportion of moisture which it retains: to preserve them has been one of M. Boucherie's principal objects. This object he says he has attained by means of solutions of deliquescent salts, introduced by absorption. Besides, these salts act not only as preservers of humidity; they seem also to act in the same manner as oily bodies, giving to the wood a flexibility which is even superior to that which it possessed when first cut down.

After various trials, M. Boucherie ascertained that saline supernatant liquors, formed principally of deliquescent chlorides, answer the purpose very well, and he has thus given value to a product which, before, was perfectly useless. He observes that to obtain the greatest effect, it is necessary that the saline solutions be very concentrated.

Although he has every reason to believe that these saline solutions are sufficient to preserve wood, he advises, for greater security, that one-fifth of pyrolignite of iron be mixed with them.

OF THE WARPING OF WOOD AND OF THE MEANS OF PREVENTING IT.

Wood increases or diminishes in volume under atmospheric influences, and when it is used without being sufficiently dried, these changes are very great and produce very disagreeable effects.

Builders, therefore, have long directed their efforts, but without any success worthy of notice, towards the means of accelerating the desiccation of wood, which is very slow when left to operate naturally. However, says M. Boucherie, no one has ever asked whether this state of siccity was the state which alone could prevent wood from warping, being of opinion that the alterations in volume were attributable to the wood containing matters which have an affinity for water, and which, by turns, yield it to, and acquire it from, the surrounding atmosphere. He thought that if these kinds of sponges were kept saturated with moisture, their volume, and that of the mass would remain invariable. Now, the means of carrying this into effect is very simple. It is sufficient to profit by the aspiring power of the wood, to impregnate it with the deliquescent chlorides. Experiments made with this view were attended with complete success.

ON THE MEANS OF DIMINISHING THE INFLAMMABILITY AND COMBUSTIBILITY OF WOOD USED FOR BUILDING.

From the time that M. Boucherie ascertained the possibility of always preserving a certain moisture in wood by impregnating it with earthy chlorides, it was easy to foresee that by means of the same substances we might not only very much diminish its inflammability, but also impede the combustion of its carbon, being withdrawn from the contact of the air by the fusion of the earthy salts which is operated on its surface and in its mass. This has been fully confirmed by the results of various experiments. Wood prepared by this means prevents the possibility of fires, except, however, in cases where the fires would be not only provoked but fed by matters foreign to the construction of the building.

OF THE INTRODUCTION OF COLORING MATTERS INTO WOOD.

This may be effected by mineral or vegetable substances. In the former case a substance already colored is not introduced; but bodies, whose mutual decomposition causes the formation of a third colored body, are successively applied. Thus, blue is obtained by passing, one after another, a salt of iron, and prussiate of potassa.

M. Boucherie has observed, with respect to vegetable coloring matters, that they do not penetrate the tissue of wood with the same facility as the preceding: certain woods even refuse to receive them, however limpid the solutions may be.

REPORT CONCERNING M. SELLIGUE'S MEMOIR RELATIVE TO NEW PROCESSES FOR MANUFACTURING LIGHTING GAS *

BY MM. THENARD D'ARCET, AND DUMAS.

The Academy of Sciences appointed us Commissioners to make a report to it concerning M. Selligue's Memoir relative to the distillation of schists and to the application of the oils thus furnished, to the preparation of lighting gas, which the author obtains by methods of his own invention ; we now fulfil this duty.

M. S. turns to profitable account a mineral substance until now very little looked after, which, notwithstanding, is very deserving of attention : he uses, in great quantity, the bituminous schist which is met with in the department of Saône-et-Loire, between Autun and the central canal. Three manufactories for working this new invention have already been established by M. Selligue: one at Saint-Leger-du-Bois, canton of Epinac; another at Surmoulin, canton of Autun; and the third at Igornay, canton of Cardesse.

In these manufactories the bituminous schists are subjected to distillation in close vessels. They leave a residue of carbonaceous matter, capable of being used as disinfecting or decoloring charcoal. These schists yield, as volatile products, oils consisting essentially of various carburets of hydrogen: these are the matters turned to account. There are disengaged, besides, during the distillation of these schists, inflammable gases, which are directed into the tube of the furnace, to render them useful as a combustible to assist in the operation itself.

Among the schists of Autun masses of very different richness are met with. Every thing which furnishes less than 6 per cent. of oil to distillation is rejected. The matters most commonly worked yield 10 per cent. on the average: but it is not uncommon for them to produce 20, or even 25, per cent., and certain varieties will produce as much as 50 per cent. of their weight, of oily matter.

These details are sufficient to show the interest with which such a remarkable product should inspire, not only geologists and manufacturers, but also chemists.

What, it may be asked, is the nature of the matter which exists in these schists, and which, though perfectly dry and solid at the ordinary temperature, yields to distillation proportions of oil amounting almost to three-fourths of its own weight?

The following is the composition of the

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* *Compte Rendu de l'Academie des Sciences*, June 1st, 1840.

oily products extracted from these schists by distillation:—

1400 kilog. of liquid bitumen, the average daily produce of two manufactories, are composed of

498	of a light oil of a density varying from 0·766 to 0·810: it is this which is applied to the production of the gas:
362	of a much more fixed oil, capable of being used for the lighting of lamps:
168	of a matter containing 12 per cent. of paraffine:
242	of pitch or tar.
1300*	

The furnaces with which M. Selligue obtained these different products present very ingenious arrangements, and might be turned to account in many analogous operations, for instance, in all those wherein dry distillation, on a large scale, is required.

The various substances extracted by M. Selligue from the schists of Autun, by means of this operation, will eventually find their place in the arts. At present we would call attention to the lightest and most volatile oil, for it is on that that the manufacture of the lighting gas is founded.

It has long been suspected that lighting gas owes its illuminating properties essentially to oily vapours, which accompany the hydrogen gas, generally containing a small quantity of carbon, which always predominates in the composition of this gas: this opinion is demonstrated by the result at which M. Selligue has arrived.

Many distinguished men of science, who have made the preparation and properties of lighting gas the subject of very attentive study, have been induced to establish as a principle, that carbonic oxide is always prejudicial in the composition of lighting gas; that it diminishes the brilliancy of the flame by lowering its temperature, on account of the very slight heat developed by its combustion. This opinion is unfounded. In this respect the processes adopted by M. Selligue do not leave the least uncertainty.

These two essential points of the theory of lighting gas receive, therefore, from M. Selligue's experiments, a solution which should give rise to modifications in the course adopted for the manufacture of gas by the old processes, where it is evidently directed according to principles which are not yet confirmed.

M. Selligue effects the preparation of his gas as follows:—

Three tubes, vertically situated in a furnace constructed on a novel and very ingenious plan, are heated to redness. The first and second contain charcoal, and as this charcoal disappears it is replaced—an operation which is performed every five hours. This charcoal is used for the purpose of decomposing the water which is introduced into the first tube, where it is transformed into hydrogen and carbonic acid, or carbonic oxide. But as it is important to avoid the production of carbonic acid, the gases yielded by the first tube are directed into the following tube, where they again come in contact with incandescent charcoal, by aid of which the carbonic acid at first formed is brought to the state of carbonic oxide. By the contrivance of the furnace this tube is the hottest of the three, which favours the decomposition of the carbonic acid.

The third tube is filled with iron chains, the object of which is to present a greater incandescent metallic surface, in order to distribute the heat in an equal and rapid manner, to the gases or vapours which traverse it.

It receives, on one part, the gases arising from the decomposition of the water, effected in the two preceding tubes; and on the other, a continuous stream of oil of schist. This oil is decomposed into new and more volatile products, and passes entirely with the gas into a cooler, which, by cooling the products, causes some of it to re-appear.

The oil of schist, therefore, is not entirely converted into gas; but that which is not changed into matters possessing the functions of gas, is found intact. It is worthy of remark, that the links of the chain contained in the tube are not covered with any carbonaceous deposit. Thus, although the oil of schist is manifestly decomposed by heat in this operation, its decomposition is exceedingly well modified by its diffusion in the midst of so great a volume of gas, as that arising from the decomposition of water, which also serves as a vehicle for it.

There go out, therefore, from the third tube, hydrogen and oxide of carbon, resulting from the decomposition of the water, and the gases or vapours arising from the decomposition of the oil. By putting into the apparatus 4 quarts of water and 5 quarts of oil per hour, 210,000 quarts of gas fit for lighting may be procured in twenty hours.

Gas, thus prepared, does not require any purification besides that which it gets in its passage through a cooler in which the undecomposed oil is condensed, as well as the stream which has also resisted decomposition.

From the cooler, the gas is passed into the gasometer.

M. Selligue's process is so simple, and requires only such a small and cheap apparatus, that it may be considered as eminently calculated to supply the wants of manufactories and private establishments, when the proprietors wish to manufacture the gas required for their own consumption.

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* This seems to be erroneous; it should be 1270.—Editors.

Moreover, the price of gas, thus prepared, seems sufficiently low, for it to be used for lighting towns.

It is important to take notice of the two following facts:—

Experiment has proved that, far from being impaired in its properties at a distance from the gasometer, gas, thus obtained, is improved at 8,000 metres from the reservoir, it presents a purer flame than at the gasometer itself.

When cooled to 25° (centigrade) below zero, its illuminating power was not perceptibly diminished.

These two facts were requisite to be proved in treating of a gas, whose illuminating power evidently depends on the presence of combustible hydro-carburetted vapours, which would be completely deposited by cold, by repose in long pipes. Experiment has shown that, if any is deposited under such circumstances, there always remains sufficient to produce the required effect.

A lamp of this gas, giving a light equal to a Carcel's lamp, consumes from 105 to 120 quarts of gas per hour.

As this gas is perfectly free from the sulphurous compounds which give so much smell to ordinary gas, it does not spread any disagreeable odour. Moreover, it does not act on metallic reflectors, which has enabled M. Selligue to combine the use of them with that of his gas, so as to light a city in the most powerful manner: for a parabolical reflector, adjusted to one of his lamps, carries to the distance of 80 metres (262·47 English feet) a light sufficient to enable one to read common-sized printing.

MM. Thenard, D'Arcet, and Dumas, the Commissioners appointed by the Academy of Sciences, have examined by themselves the apparatus fitted up by M. Selligue at the *Imprimerie Royale;* that established for lighting Dijon; and that with which Les Batignolles are now lighted. They have gathered information concerning the apparatus which M. S. has set up in other towns.

It has been demonstrated to them that M. Selligue has rendered an indisputable service, by showing every thing that can be extracted from bituminous schists, by means of dry distillation: and by adding, in order to affect this, apparatus of excellent construction, invented by himself.

They are also unanimously of opinion that M. Selligue has been able to turn to most advantageous account the decomposition of water, by means of charcoal, in order to produce, by means of cheap oily substances, the greatest quantity of lighting gas they are capable of producing, whose combination is of his own invention, and whose effect leaves nothing to be desired.

The efforts made by M. Selligue deserve, therefore, the attention of the Academy, which, perhaps, will be kind enough, by its approbation, to encourage him to persevere in the new plan which he has entered into, and wherein he has already obtained undeniable success.

The conclusions of this report were adopted by the Academy.

REMARKS ON THE FORMER USES OF PURPLE OR SCARLET COLOURING INSECTS. NEW COCHINEAL OF PERSIA AND ARMENIA.

BY M. J. J. VIREY.

Before the discovery of the Mexican cochineal (*coccus cacti coccinelliferi*), the ancients knew how to obtain a purple dye, not only from the univalve shell-fish, called murex, but also from several insects. A purple dye is spoken of in the Bible; and every thing tends to convince us that it was not extracted (at least not entirely) from the kermes, or *coccus ilicis*, but from a cochineal procured from Armenia and Persia, formerly known to travellers and merchants by the name of *ischrew.* This term signifies a little red worm, like our word vermillion, and like the word scarlet (or *scharlath* of the Germans) comes from *kermesinas*, &c.*

This cochineal was not well known to naturalists, until the publication of the recent Memoir of M. Brandt.† It abounds in Erivan, and the valleys of Ararat; parts of Persia and Armenia, now incorporated with the empire of Russia. It is particularly common in the swampy meadows surrounding Araxis, and fixes on the root of the *Poa Pungens*, or the *Oeluropus Lævis* of Trinius.

It is evident, therefore, that its habits resemble those of the *Coccus Polonicus*, described by Breyn, which grows on the *scleranthus perennis:* but the Armenian cochineal is much thicker than the Polish: it requires but from 18 to 23 thousand individuals to weigh 360 grammes, or a pound (of 12 ounces), whilst it requires 100, and sometimes 130 thousand of the *Coccus Polonicus*, for the same weight. Mexican cochineal runs 20 to 25 thousand to the pound: therefore it presents scarcely as much colouring matter as the Armenian; but the

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* Hamel. *Mem. Acad.* Petersburgh. Sixth series, vol. 3.

† Ibid., anno 1835. He has discovered a new race, named Porphyrophora.

Polish gives the least (it is the *Porphyrophora Frischii.*)

According to Brandt, Armenian cochineal (*porphyroph. Hamelii*) is distinguished by thirteen or fourteen articulations to each antenna, in the male, and a brush of hair at the anus. The female, in the state of larva, lives in a shell attached to the root of the plant: it can dig the ground with its fore paws. When perfect, the mouth is entirely obturated, as in the Polish kermes; for these animals are of the same genus, although they are of different species.

We may also mention, among tinctorial insects, the *trombidium tinctorium* Fabr. (*acarus tinct.* of Linnæus), which is common in hot climates, as in Senegal and Sennaar, according to Caillaud, and particularly in Guinea, where it has begun to be made use of in dyeing.[*]

The Carapathos, very small red acarus, like our roach, are immensely numerous in the woods and thickets of Brazil[†], Paraguay[‡], and French Guinea,[§] and a beautiful colour might also be extracted from it, were it not for the insupportable itching which they occasion on the skin. However, the vapour of vinegar causes them to perish easily.

The beautiful butterflies, or the coleoptera which it is desired to preserve uninjured for collections, may be killed by putting a drop of acetate of strychnia in either the trunk or the mouth. The insect falls motionless without spoiling its shape.[||]

ON THE DESICCATION OF BEET-ROOT BY COLD.[¶]

BY MM. BONAFOUS AND PAYEN.

Although M. de Lirac's ingenious process for drying beet-root by the solar heat may be successful in Southern countries, it is inapplicable in Northern ones, and requires much caution even in the former where storms are frequent and unexpected.

M. Payen and myself proposed to find out some means of drying beet-root in Northern countries, which are the best adapted to its culture. We at once thought of congealing the roots, which, disaggregating the tissues, facilitates the evaporation of the water of vegetation. Our first attempts, made in Piedmont on entire roots, proved to us that the time necessary for desiccation in the open air would be too long to be operated during frost, and that after the thaw the effused juices would rapidly be spoilt. Then, trying to expose to frost slices of the root, during the last frosts which existed in Paris, we obtained a desiccation sufficiently advanced to ensure preservation, or at least to allow of the drying being completed, in a current of air, more or less warm. The crystallized sugar did not undergo any alteration, which may easily be conceived, since the water which is a chief cause of the injurious reactions, had, in great measure, been eliminated at a low temperature.

I hasten, whilst we are repeating our experiments, to communicate the result of this first attempt to the Academy of Sciences, with the view of calling the attention of experimentalists to a process which, when perfected, may present new resources to one of our most important manufactures. This mode of desiccation would have the advantage of spreading, in the country part at least, of the sugar manufacture, which is so fertile in results of many kinds. Agriculturists themselves might prepare a matter easily preserved, valuable enough to bear the expence of carriage, and sufficiently rich in sugar to furnish that product in abundance without much trouble.

ON A MEANS OF DETERMINING THE LENGTH OF TIME AN IODIZED PLATE SHOULD REMAIN EXPOSED TO LIGHT, IN ORDER TO GIVE A GOOD PHOTOGRAPHIC IMAGE.

BY M. SOLEIL.

The alterations in color which chloride of silver undergoes by the action of light may be turned to account, in fixing the time necessary for the production of photogenic images, since the same portion of radiation gives rise to each.

After many unsuccessful attempts, I stopped at the apparatus of which the following is a description:—

A brass tube, 40 millimetres long and 25 in diameter is taken: it is blackened internally, open at one of its extremities, and closed at the other, by a moveable plate, before which a card is slipped; on this card, previously covered with gum, or dextrine, there is applied, with a spatula, a layer of moist chloride of silver, of about a millimetre in thickness; it is kept, for this purpose, in a glass flask covered with black paper.

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[*] Slubber, Observ. microscop. in aranea holosericea, tab. 2.

[†] Maximil. de Neuwied, Voyage to Brazil and Bahia, vol. iii. pp. 188, 189.

[‡] They are called *Vinchuca*, according to Azara. *Voyages*, vol. 1. p. 208.

[§] Piérre Barère. *Equinoctial France:* they are called *ticks*.

[||] The inhabitants of Santa Fé hunt these insects to eat them. They make omelettes of them, or, after having fried them, they cover them with sugar, to make comfits of them. Azara, *Voy. Merid.* tom. i. p. 199. It is *tanachoura*, Max. de Neuwied, *Voy.* vol. 1. p. 77. and vol. 2. p. 263. et seq.

[¶] *Compte Rendu de l' Academie des Sciences*, May 4th, 1840.

The tube, thus disposed, is turned from the side of the object of which we wish to take the image, and the time that the chloride of silver takes to become of a greyish slate color is reckoned. This time is equal to that during which the iodized plate ought to be kept in the camera obscura.

PHOTOGRAPHIC DRAWINGS OBTAINED ON SILVERED PAPER.

BY M. RAIFE.

According to M. Raifé, the substitution of silvered paper presents considerable economy; and it offers this advantage for travellers, that drawings, having once been fixed by means of hyposulphite of soda, may be kept like ordinary drawings in an album.

The silvered paper should be stuck on a card: afterwards, when it is dry, it is sprinkled with fine tripoli and rubbed with cotton. The iodizing is effected as quickly and as well on this paper as on metallic plates, and the action of light in the camera obscura is quite as rapid.*

ON A PROCESS FOR FIXING PHOTOGENIC DRAWINGS.

EXTRACT OF A LETTER FROM M. PRESCHOT TO M. ARAGO.

In one of the sittings of last month you mentioned a process for fixing photogenic images on metal (see *The Chemist*, No. VI., p. 187). Knowing, as I do, the interest you take in the beautiful discovery of the Daguerreotype, I hope you will excuse the liberty I take in troubling you with results which I obtained in experiments made a few months ago.

Photogenic images, obtained by M. Daguerre's process, may be fixed by treating them with a solution of hydrosulphate of ammonia. For this purpose, a concentrated solution of this fluid is mixed with three or four volumes of pure water, which is poured into a flat vessel, in sufficient quantity that the plate may be steeped in it horizontally, and just covered with the fluid. When by the action of the fluid the tints of the drawing are sufficiently changed, which occurs in less than a minute, the plate is to be withdrawn and put into a flat vessel containing water; it is afterwards taken out and dried. By this process the polished parts of the metal are tinged grey by the sulphuret, and the amalgamated parts are not attacked, or, at least, but very little. The tints may be varied by the concentration of the fluid, or the duration of the immersion; however, too long an action turns the lights yellow. Photogenic images, treated in this manner, bear rubbing with the finger, without losing any of their details.

ON THE FIXING OF PHOTOGENIC IMAGES.

BY M. CHOISELAT.

Chloride, and particularly iodide, of silver, dissolved in hypo-sulphite of soda, may be advantageously employed for fixing the images of the Daguerreotype. Steeped in these solutions, they are under the electric influence exerted by the copper on the dissolved silver, and thus become ineffaceable.

Instead of the hypo-sulphite, a mixture of iodide, bromide, &c., of potassa, may be employed.

The iodide of silver best adapted for this operation is that which is obtained by treating, with the aid of heat, a plate of this metal, by the iodide precipitated from alcohol by water, afterwards dissolving the iodide formed and adhering to the plate in the hypo-sulphite.

MANUFACTURE OF CHLORINE GAS.

To the Editors of The Chemist.

Gentlemen,—The common method of making chlorine gas from muriatic acid and manganese, is to expose the acid and manganese together to heat, under the boiling point, in a leaden vessel or still, until all the chlorine gas is expelled. I have found, however, in operating thus, a considerable corrosion of the lead and rapid destruction of the still to be the consequence; so much so, as very much to increase the expense of manufacturing chlorine gas.

I shall, therefore, feel much obliged by any of your chemical correspondents informing me of a method of securing the lead from the attacks of the muriatic acid, or pointing out some other kind of apparatus in which this gas may be prepared at a less expense.

When manganese, common salt, and sulphuric acid, are used instead of muriatic acid, for furnishing chlorine gas, the corrosion of the lead apparatus is not so great; and this is the process usually adopted.

I am, Gentlemen,
Your humble servant,
W. S.

June 9, 1840.

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* *Compte Rendu de l' Academie des Sciences*, No. 21, May 23rd, 1840.

III. PHARMACY, &c.

EXEMPTION OF DRUGGISTS FROM SERVING ON JURIES.

To the Editors of The Chemist.

Gentlemen.—As a medical reform measure is likely soon to be brought before the House of Commons, I hope I may be allowed, through the medium of your Journal, to suggest to the retail trade throughout the kingdom the propriety of trying for, and the probability of obtaining, a total exemption from attendance on juries, whether in courts of law, coroners' courts, or elsewhere. I have been led to the consideration of this subject from having been subjected to much personal inconvenience (too often the only incentive to public spirit) in an attendance on juries in town; and I propose the following points as powerful pleas for petitioning the legislature on the subject.

I. The "trade" must assume its proper position as *a part* of the medical profession.

Whether, in the present glorious state of confusion of the medical institutions, it be possible to define or make out what an apothecary really is, and who is an apothecary, is not very material; but it is of the greatest consequence that the legislature should be made aware of the important position, that chemists and druggists really hold among the curators of the public health. The very idea of this I am aware would graciously be sneered away by a large party of the profession, viz., the general practitioners; but let such be reminded, that between the two other branches, viz., the *lowest*, or that one very much beneath themselves (the chemists and druggists, which I most humbly admit), and the *highest*, or that composed of the physicians, and the surgeons, κατ' ἐξοχην,—that between these two branches an almost equal relative importance exists, in the case of the patient, so far as concerns his being brought to a state of health. For to what purpose, I would ask, does the physician or the surgeon weigh the choice of remedies and their quantities in his experienced mind, if the raw apprentice or the inexperienced assistant (during the constrained absence of the chemist himself) is to weigh the materials of these remedies in the balance with a slovenly incorrectness?

II. I have still a stronger case to make for the justice of chemists being exempted from state service. I allude to the severity with which the law deals with them in case of fatal inadvertence or mistake.

It is natural to expect, and would of course be objected, that other trades would plead excuses for non-attendance on juries, if chemists and druggists were exempt; but where is there any occupation that exposes such risk and danger as that of a chemist in the hands of the inexperienced?

Mischances and accidents of a fatal kind, when they occur in other professions, are usually translated by courts and juries into verdicts of "accidental death," or "homicide by misadventure," as I have seen it quaintly put in some cases. But only let the hand of a thoughtless youth drop upon "Hyd. Am.-Chlor." instead of "Hyd. Chlor.," let an apprentice only read "Hyd. Bi-chloridas," for "Hyd. Chloridas," so that *death* be the result of the "misadventure," and his "attendance will be required in court" on much more unpleasant business than persons of other crafts are at all liable to,—that of hearing a verdict of "manslaughter" returned against himself, perhaps by his fellow-townsmen!

Such are the grounds on which the chemist and druggist may, in my opinion, very justly claim to be exempted from state service, of whatever kind; and if you think the case to be really good, I hope you will afford it the assistance of your own pen; convinced that you will be ready at all times to advocate the best interests of our profession.

I am, gentlemen,
Your most obedient humble servant,
W. Gallard, Chemist and Druggist.
Hampstead, June 15, 1840.

[We heartily coincide with Mr. Gallard, with respect to the danger, impropriety and inexpediency of compelling chemists and druggists to serve on juries. They are frequently so circumstanced, more particularly in provincial towns, as to be utterly unable to obtain an efficient assistant while absent, and are obliged to trust to an apprentice, or, not unfrequently, their wives, to the great risk of the lives, health, and safety of the community, and danger of their own reputation, added to the heavy penalties attendant on any fatal consequences arising from the ignorance of such persons. The legislature should therefore be appealed to, and measures to secure so desirable an object ought immediately to be adopted. Such appeal and measures would, we have no doubt, be successful,—at least, we think that no objection could possibly be raised which could not immediately be removed. So great an abuse ought speedily to be reformed.]

LEECH MONOPOLY.

To the Editors of The Chemist.

Gentlemen.—In reply to a letter which appeared in your excellent Journal for June, headed "Leech Monopoly," I would take the liberty, with your kind permission, of offering a few remarks.

At first sight it does appear singular, that this useful animal should have retained so high a price for such a length of time. There cannot be a doubt, however, that the supply of the German or speckled leech, is not, and has not been, for at least eighteen months, sufficient to supply the demands made upon the merchants. I cannot see the force of the accusation brought against the wholesale trade in leeches, neither do I think the traffic in this animal so limited as your correspondent insinuates. I think that the chief leech-holder in this country is Mr. Hudson of Hull, who many years ago succeeded to the ponds, of which he is at present the proprietor. Now, he, some months ago, failed in his stock completely, and was for a time quite unable to supply the German leeches at any price. Previous to this the value of the leech was rising, but since then it has fallen considerably. His ponds are, I believe, constructed with much care and nicety, the animal possessing every advantage. From some observations, it does appear to me, that the principal cause of the leech dying, is a string of mucus, which seems to be generated in the water, where many are kept, and this, winding round the body, acts as a tight ligature, and produces death. To obviate this Mr. H. has his ponds constructed with a division of earth between each, into which the animal burrows, and in this way gets rid of his enemy, and reaches another pond. While on this subject, I would particularly recommend, to all those who may keep leeches, to wash well two or three pieces of *open* sponge, so as to free it from taste and odour, and then to throw them into the jar amongst the leeches. By this simple means the leeches will be kept very healthy, for they creep through the open parts of the sponge, and get rid of the slime. Ever since I followed this plan myself, I have found the mortality diminished at least one half. But although Mr. H. deals so extensively in leeches, he holds no monopoly, as there are many individuals, who bring over a large stock from Hamburgh, and dispose of them in London, throughout England, or even wander with their jar as far north as this place. No greater surprise should exist regarding the high price of leeches, than there should be regarding the sudden and unaccountable rise which some drugs take. As well blame a particular druggist for the rise in camphor, which recently took place, as charge any party with a "leech monopoly." Besides, the price has fallen at least 6s. per 100, within a few months; and I should hope that, as the season advances, it may fall still more. And I cannot but suppose, that if any exclusiveness was practised in the disposal of leeches, the countries in which they are found are not at such a distance, neither are the modes of communication with them so difficult, but many would be ready to take advantage of and destroy it. As long, therefore, as the real speckled leeches cannot be had in sufficiently great numbers, there must be a proportionally high price attached to them.

In conclusion, I would state, that there is at present and always has been, a considerable difference in the price of the speckled and the green French leech, varying from 5*s.* to 10*s.* per hundred.

I am afraid I have trespassed on your patience, but I considered it a duty which the retail chemists were bound to perform, to reply to the letter of an "*Enquirer.*"

I remain,
Your most obedient servant,
I. M.

Edinburgh,
June 11*th*, 1840.

FORMULÆ FOR FERRUGINOUS MEDICINES *

These medicines being now so much employed, we are induced to give, from the *Journal de Chimie Medicale*, the formulæ of those most commonly made use of.

DR. BALLY'S FERRUGINOUS LOZENGES.

Powdered iron filings	16 grammes.
Chocolate paste	16 grammes.
Powdered saffron	4 grammes.
Mucilage of gum tragacanth	Q. S.

Make with the whole of it lozenges of the weight of six decigrammes (12 grains). Three or four of them to be given every day.

LOZENGES OF CITRATE OF IRON.

Citrate of iron	10 grammes (2½ dr.)
Citric acid	10 grammes.
Essence of lemon	4 decigrammes.
Very fine sugar	160 grammes (5 ounces).
Water	Q. S.

To be made into gout lozenges of 10 grains each. Five or six to be given every day.

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* *Journal de Chimie Médicale*, May, 1810.

LOZENGES OF TARTRATE OF IRON.

Tartrate of iron	1 gramme (18 gr.)
Sugar . .	32 grammes (1 ounce).
Essence of mint	2 drops.
Mucilage of gum tragacanth,	Q. S.

Make 36 lozenges, each of which contains 2 centigrammes (½ grain) of tartrate of iron.

SYRUP OF CITRATE OF IRON.

Aqueous solution of citrate of iron . . .	48 gr. (1½ oz.)
Sugar syrup . . .	1000 gr.

Every ounce of this syrup, the formulæ of which is given by M. Moussu, should contain 30 centigrammes (4 grains) of citrate of iron.

This syrup may be made directly by taking 10 gr. of citrate of iron, dissolving in a little water, and incorporating with it 96 grammes (3 ounces) of sugar syrup.

SYRUP OF CITRATE OF IRON.—M. BERAL'S FORMULA, 1831.

Simple syrup . .	458 grammes.
Citrate of peroxide of iron	30 grammes.
Spirit of lemon and alcohol	7 grammes.

DR. COLOMBAT'S FERRUGINOUS POWDER.

Pure sulphate of iron .	2 grammes.
Tartaric acid . . .	6 grammes.
Sugar	12 grammes.

All these substances are reduced to a very fine powder, and divided into twelve equal parts.

M. QUESNEVILLE'S FERRUGINOUS POWDER.

Analysis has shown that this powder is formed of

Bicarbonate of soda	16 grammes (4 dr.)
Tartaric acid .	28 grammes (7 dr.)
Pure sulphate of iron	16 grammes (4 dr.)
Sugar . .	32 grammes (1 oz.)

The tartaric acid is reduced to a coarse powder, as well as the bicarbonate of soda; these are mixed with the other substances, and confined in a flask. The dose is a spoonful in 250 grammes of sugared water.

SACCHARINE CARBONATE OF IRON.

To the Editors of The Chemist.

Gentlemen,—Amidst the number of preparations of iron, there still appears to be a deficiency, in so far as we have not a mild, and at the same time, efficient remedy. The sulphate no doubt is a powerful salt, and much employed, but rarely otherwise than in combination. The carbonate of the oxide has been long known, and most successfully employed, as a tonic, but the quantity of ʒj or more, given repeatedly during the day, is so nauseating, that many have thus been prevented from taking it, and deriving that benefit, which, had it been palatable, might have resulted from its use. My object now is, to introduce to your notice, and to that of your readers, a new and very important preparation of this metal—the *Saccharine Carbonate of the Protoxide of Iron.* Although it is officinal in the last edition of our Edinburgh Pharmacopœia, it appears to be quite overlooked, for few town, and fewer of the country medical practitioners seem to be acquainted with, and the retail chemist to be equally ignorant of, the preparation; of course there are exceptions, and I may add, some of our first physicians employ it with decided advantage.

The method of preparing this compound is simple enough, but requires great care. It consists in decomposing pure sulphate of iron, by means of carbonate of soda. The carbonate of the oxide thus obtained, is to be well washed with cold water, pressed as dry as possible, and the pulp immediately triturated with finely powdered sugar. This is ordered to be carefully dried with a heat not much exceeding 150° F. For the sake of enabling any one to prepare it, I shall add a few practical hints. ℥ iv. Sulph. Ferri Pur. ℥ v. P. Sodæ Carb.: each dissolved in Aqua distillat. ℥ xl., ought to yield about ʒx. of the pulp. This added to ℥ ij. Pulv. Sacchar. Alb. opt., should produce, when dried, in all ℥ ij. ʒ vj. Proper attention to the temperature employed in drying, is indispensable, as the process will be very much lengthened, if the heat is not sufficient; and, on the other hand, if too great, it will as surely be blackened and destroyed. It will take at least 10 or 12 hours to dry it properly, in a broad evaporating basin, with a heat ranging from 130° to 160° F. It must then be rubbed to powder, but not *sifted.* I have always preserved it from light and air, which keeps it much better. It would appear to be a sesquioxide of iron, mechanically mixed with sugar, and protoxide of iron. During the drying, brisk effervescence takes place, indicating the escape of carbonic acid. When recently prepared, it ought to have a grayish-green colour, inclining to brown. Soluble in muriatic acid, with brisk effervescence. Taste sweet, but slightly astringent. Granular in appearance, easily suspended in water, but apt to precipitate if allowed to stand. The usual dose is from seven to ten grains twice or thrice daily.

It may surprise many to learn that this preparation, apparently so weak, (from the comparatively small quantity of the oxide contained in ℥j. of the powder), is equivalent, when given in the above minute doses, to 60 grains of the old carbonate, repeated three or four times a-day. When I make this statement, it is not an assumption, upon mere theory, for I am acquainted with some cases, of chronic stomach complaints, which had resisted the effects of many tonic remedies, and amongst them the Carb. Ferri Præc., but which yielded to the influence of this new compound. One case I may give in illustration. A lady about 50 had been for some years quite a martyr to deranged stomach. She complained chiefly of severe pain, in the immediate region of that organ, sickness, heartburn, slight giddiness, loss of appetite, and all the other concomitants of sympathetic nervous derangement of the stomach. Under the directions of her medical adviser, she ran the gauntlet of the most fashionable remedies. Amongst other things she took the Sulph. Ferri, combined with Ext. Hyosc., but derived more benefit from the Carb. Ferri Præc. than any other preparation. She was at last reduced to that condition that nothing afforded relief, during these painful attacks, but large and repeated doses of the latter substance. She was much averse, however, to swallowing such large quantities of this disagreeable compound, although compelled to do so in order to gain cessation from pain. About two months ago she was ordered the Saccharine Carbonate, in 7½ grain doses, repeated twice a-day. Upon finishing 12 of those powders, she experienced great relief, and ere she had finished 48, (increased in quantity to 10 grains, and taken three times a day,) she was completely freed from a pain which had not, until then, been entirely absent, for some years. I have given you this instance, in the hope that it may induce some to try its powers, wherever a chalybeate is wanted.

I am not aware of this salt having been as yet employed in any other cases of disease than stomach affections; but might it not very easily be combined with myrrh and aromatics, formed into pills, and administered, instead of the nauseous Mist. Ferri co.? The numerous advantages which this preparation appears to possess, are such, that I am sanguine enough to suppose, that it may soon be used as an emmenagogue, and in fact in all those cases in which the use of iron is indicated. In speaking of the Saccharine Carbonate, one thing must not be lost sight of, namely, that it will be found a most elegant and pleasant mode of giving iron, few if any objecting to its taste, which is a great desideratum. I send you herewith a small portion in order that you may see the marked difference, which exists, between this and the old preparation.

At present I add nothing more, I am only afraid of having encroached too much on your patience,

I have the honour to remain,
Gentlemen,
Your most obedient servant,
I. M.
Retail Chemist.
Edinburgh, June, 1840.

[This is by far the most elegant and effective preparation of iron we have seen for some time, and as such we feel we can safely recommend it to the notice of our readers. It is sweet, and perfectly free from nauseous taste. It may be taken by the most fastidious persons without any inconvenience.]

FORMULÆ FOR THE EMPLOYMENT OF LACTATE [illegible] IRON.

BY M. [illegible]P.

Lactate of iron, [illegible] the investigations of MM. Gélis and [illegible] and M. Bouillaud's report, * have lately introduced into Therapeutics, begins to be called for in the shops. It is therefore important to give certain officinal formulæ which may allow medical men to calculate the quantity of salt employed, under various pharmaceutical forms. The following [illegible] those proposed by M. Cap :

LOZENGES OF LACTATE OF IRON.

Lactate of iron . .	30gr.
Sugar	360gr.
Mucilage of gum arabic .	Q.S.

Make, secundum artem, lozenges of the weight of 65 centigrammes, which will each contain 5 centigrammes of the salt.

SYRUP OF LACTATE OF IRON.

Lactate of iron . .	4gr.
Boiling distilled water .	200gr.
White sugar . . .	400gr.

Lactate of iron being soluble only in 40 parts of boiling distilled water, a greater quantity could scarcely be introduced into a syrup. This proportion is a 150th (about 4 grains in the ounce). The process which M. Cap found most successful is the following :—

The salt is triturated in 4 times its weight of powdered sugar; it is quickly dissolved in the whole of the distilled water; it is poured into a matrass, which is placed in a

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* See *The Chemist*, No. IV., p. 126.

sand-bath, after having added to it the remainder of the sugar, broken in small pieces: as soon as the sugar is dissolved, the syrup is filtered, and, when cold, is confined in well-corked bottles. This syrup has a slight amber tint, and keeps very well. I think its use more convenient than that of lozenges, because the ferruginous taste does not remain so long in the mouth.

PILLS OF LACTATE OF IRON.

Lactate of iron . .	āā a gramme.
Marshmallow power .	
Honey	Q. S.

Ft. 20 pills, which should be silvered immediately, or covered with gelatine prepared according to Mr. Garot's process.[*]

I give this formula, which, doubtless, may be modified in its proportions, merely to inform medical men that it would be improper to put, in contact with lactate of iron in a pilular mass, astringent extracts, or salts capable of decomposing it.

ON THE EFFECTS OF IODINE.[†]

BY DR. ASMUS.

However different may be the opinions concerning the effects of iodine, it seems at least to be ascertained that this remedy, which, in the state of spirituous solution, acts as a poison, and which physicians very rightly fear to make use of, is one of the most salutary and indispensable in medicine, when employed in the state of hydriodate or of iodic acid. Coindet made his first experiments by means of iodate of potassa, and Dumas foresaw, twenty years ago, the dangers which would arise from using the spirituous solution, preferring, in all cases, a hydriodate. The disastrous consequences which occurred when this great remedy was first employed, caused it to be confined to too few cases, until Lugol at length assigned it the rank it merits; *sed adhuc sub judice lis est:* even now, physicians are not unanimous as to the nature of the remedy in question.

While some, without any difficulty, recognise it as an antiphlogistic, others fear the heating action of the preparations of iodine, and the analogy supposed to exist between the effects of iodine, chlorine and bromine, is losing ground more and more. It may not, therefore, be uninteresting to communicate a few observations concerning the effects of iodine in diseases wherein the influences of which we speak would be presented accurately and powerfully, and wherein it would always and without restriction, injure or be useful. These influences are perceived in inflammatory diseases. I have had opportunities of trying this remedy in many persons affected with ptyalism, and of observing the salutary effects of iodine against this disgusting symptom. Moreover, I have already published the results of them. Although then, as now, that I have often employed iodine, I had not observed that it exercised a great influence over the vascular system, I nevertheless feared to employ it in true inflammations, until the following fact had rendered me more bold.

A servant was affected with a violent consumption: he had already been bled three times; powerful doses of stibial tartar had been administered, blisters were applied, and the disease did not diminish in intensity; the symptoms of suffocation also increased, whilst the pulse, becoming uniformly softer and smaller, made me hesitate to continue the bold use of this antiphlogistic treatment. Calomel in copious doses, according to Hamilton's method, produced some amelioration, when a violent ptyalism presented itself. The inflammatory symptoms again increased: the whole mouth was covered with mercurial ulcers, so that the patient could scarcely open it, and the breath had a fetid smell, when I prescribed hydriodate of potassa: I administered two drachms of it in four days, and consequently more than 80gr. of iodine. The immediate result of the first doses was amelioration of the odour exhaled from the mouth, and four days after, the ulcers, with the exception of one, were cicatrized: the salivation again became normal, and the inflammatory symptoms had disappeared, so that the patient, except great weakness, might be considered as re-established.

From this observation it may be concluded that the fear of employing iodine in inflammatory *habitus* has but little foundation, although it may be doubted whether it should ever be used in true inflammations.

I intend to publish the observations which I have already made, and those which I may make hereafter: I will here add only that iodine produced good effects in a woman aged fifty years, who was affected with catarrh of the lungs, accompanied with a copious expectoration, partly tuberculous and partly pituitous. At the expiration of a few days, the expectoration ceased, and the chest became more free; but the patient, satisfied with the relief which she experienced, desisted from using the remedy for the sake of economy.

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[*] For a process of making capsules of gelatine, see *The Chemist*, No. IV., p. 126.

[†] *Caspar's Wochenschrift für die gesammte Heilkunde.*

In cases of periostosis, iodine ointment * exercises a solvent power; an effect which was still more remarkable in a case of tumor of the left sterno cleido-mastoidens of a married woman who was affected with syphilis. The dyscrasy was stopped probably by means of the cure of Berg, but the considerable tumour, which was as hard as a stone, resisted all remedies. Twenty-five grammes of this ointment reduced the circumference of the tumour almost to nothing, and most probably it is now entirely dissipated, for I have not seen the woman for some time.

I was less fortunate in employing this remedy in membraneous angina. Copper and calomel had not produced any effect: nor had bleeding caused any amelioration. The state of the patient had already become desperate when I determined on trying iodine. I placed compresses steeped in tincture of iodine on a sore which had previously been produced by a blister, and I administered internally iodine and hydriodate of potassa in large doses. But it was without any good effects; the rheum, after each dose, became, on the contrary, more frequent and more disquieting, and I was compelled, twelve hours after, to discontinue it.

ON THE ACTION OF DIURETIC MEDICINES.†

BY M. JULIA DE FONTENELLE.

At the sitting of the Academy of Sciences, on the 11th of May, M. Julia de Fontenelle made known the results of experiments by which he undertook to prove the action of diuretic medicines.

These experiments were made on three persons, and were pursued for eight months. M. J de F. kept an account, not only of the quantity of liquids taken as drink, at meal-time, or as vehicles for medicinal substances, but likewise of the quantity of water contained in the solid food. He kept account also of the atmospheric temperature, and of the frequency of pulse in each individual subjected to this experiment. From his investigations he concludes that most of the drinks considered diuretic are not more so than pure water; and that with respect to substances which really have an influence on the secretion of urine, there are some which, according to the doses in which they are administered, may produce exactly opposite effects.

ON A SUBSTANCE EXTRACTED FROM THE BUDS OF THE LILAC.‡

BY E. WISLIN.

The March Number of the *Journal de Chimie Médicale* contains an article entitled: *New substitute for sulphate of quinine*,§ discovered by M. Rigatelli. The properties attributed to this febrifuge appearing to me to present a great analogy with a substance extracted from the buds of the lilac (syringa vulgaris), I take the liberty of addressing this to you, begging you to insert it in an early number of your journal.

In 1836 and 1837, seeking to isolate the active principle of lilac buds, I obtained only a complex extractiform matter, of an umber color, extremely bitter, retaining very tenaciously the herbaceous odour of the buds; soluble in water and in alcohol; insoluble in ether, anhydrous alcohol, &c.; Drs. Berthet and Ducroqût administered it with success in diseases where sulphate of quinine had failed.

Not wishing to continue my experiments without the participation of M. Cruveilhier, who first observed the febrifuge properties of the lilac, I wrote to him in October 1837: ‖ he was kind enough to reply immediately, approving of my plan and promising me his co-operation in the clinical experiments which would be necessary. Shortly after this I showed this substance to M. Deleschamps, of Paris.

Various circumstances compelled me to interrupt this work, which I intend to resume this spring, when I shall be able to procure lilac buds: I will then hasten to acquaint you with the result.

ON THE SALE OF POISONS.

To the Editors of The Chemist.

Gentlemen,

It has often struck me that something ought to be done in reference to the sale of poisons; that there is too great a facility afforded to the public for procuring the same, will, I think, be generally admitted; in some instances, no doubt, too little care and discrimination are exercised in the sale thereof, and on referring to the statistics of poisoning,[*] ample proof will be found that many deaths have occurred through culpable carelessness and ignorance, as well as from the design of the purchaser meditating self-destruction.

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* Iodine ointment may be prepared by rubbing together, so as to form an ointment, one scruple of iodine and one ounce of prepared lard. Editors.

† *Compte Rendu de l'Académie des Sciences.*

‡ *Journal de Chimie Medicale*, May 1840.

§ For which see *The Chemist*, No. V., p. 157.

‖ It was not my intention to speculate on the success of these trials. The following is a passage of my letter to M. Cruveilhier:—"I cannot conclude this letter, Sir, without assuring you that the authority of your name shall not, in this case, be used to encourage a commercial speculation, the experiments which I solicit having no other object than the interest of science."

In the forthcoming measure of medical reform, I trust this important point will not be lost sight of, and that a remedy, as far as practicable, may be provided: in the mean time I would suggest that it would perhaps tend in some degree to avert the dreadful act of suicide if it were to become an established rule, that the party requiring poison, should on no account be supplied without being accompanied by a person to witness the transaction; this would exonerate the retailer of poisons from all blame, and I apprehend, when known, defeat the suicidal intentions of many.

I throw out this hint, hoping some of your numerous readers and contributors may be able to devise some better plan.

and remain,
Gentlemen,
Yours respectfully,
J. T.

June 13, 1840.

CALOMEL WITH IODINE AND SUGAR.

A combination of calomel with iodine and sugar is used in Riga in cases of hydrocephalus in children, with remarkable success. The following is the most common prescription, as given in Schmidt's Jahrbücher.

R.	Hydrarg. submur. .	gr. viij.
	Iodin.	gr. j.
	Sacchari albi . .	gr. lxxx.

M. Ft. pulv. divid. in xvi partes equales.

Powdered digitalis and *pulvis gummosus* are occasionally combined with it. If the calomel and iodine be first rubbed together and the sugar afterwards added, the powder becomes red; but if the calomel and sugar be first commixed and then the iodine added, it will be greenish; deutiodide of mercury being formed in the first case, and protiodide in the second. Most cures have been effected by the red powder.

According to theory, eight grains of calomel, combined with one grain of iodine, should yield

Protochloride of mercury (calomel) 6·124 gr.
Deutochloride of mercury (corrosive sublimate) . . . 1·078 gr.
Deutiodide of mercury . . 1·798 gr.

In the result of actual analysis, the only difference was, that a trace of protiodide of mercury was found in the powder, and consequently more corrosive sublimate than theory supposes.

As every powder is made, according to the above prescription, with half a grain of calomel and $\frac{1}{16}$ of a grain of iodine, it contains after manipulation:—

Corrosive sublimate, 0·067, or about $\frac{1}{16}$ of a grain.
Calomel . . 0·383, or about $\frac{2}{5}$ of a grain.
Red iodide of mercury, 0·112, or about $\frac{1}{9}$ of a grain.

GOUT PAPER.[†]

According to M. Berg, an apothecary at Stuttgart, English gout paper (*Charta antirheumatica*), may be prepared in the following manner:—

R.	Euphorbii . . .	℥ j.
	Cantharid. . . .	℥ ss.
	Alcoholis . . .	℥ v.

Digere per viij. dies, cola et filtra; tum adde

Colophonii albi . .	℥ ij.
Terebinth. Venet. .	℥ iss.

M. F. l. a. vemix.

Common writing paper is to be spread over three times with this varnish. Gout paper prepared in this manner adheres very firmly to the skin, and is not apt to shift from its place.

The following prescription for a *charta derivans* is given by M. Pirwitz, an apothecary at St. Petersburg.

R.	Cantharid. Pulv. . .	℥ ss.
	Resin. Guaiaci . .	℥ iij.
	Galbani . . .	ʒ vj.
	Alcoholis . . .	℥ vj.

Digere l. a., tum cola et adde

Colophonii . . .	℥ iiss.
Terebinth. Larac. .	ʒ j.

Salve l. a., ut f. vemix.

This varnish is to be gently heated in a water-bath, and then spread upon fine letter paper two or three times with a brush: care should be taken that each layer is dry before another is put on.

INCISIVE PECTORAL LOZENGES.[‡]

Dr. Grunn, of Photsburg, recommends the following formula in cases of chronic catarrh:—

R.	Powdered sugar .	500 grammes.
	Flake manna .	125
	"Thridace" . .	8
	Ipecacuanha in powder	18
	Squils in powder .	4
	Mucilage of gum tragacanth, q. s.	

Mix: make a homogeneous paste and

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[*] See *The Chemist*, No. II. p. 51.

[†] *Schmidt's Jahrbücher.*

[‡] *Journal de Chimie Médicale*, May 1840.

divide it into lozenges of 1 gramme. Five or six to be taken every day.

ON RE-VACCINATION.*

At the sitting of the Academy of Medicine, held on the 28th of April, M. Sédillot read part of a long Memoir on re-vaccination. The object of this work was to shew the indefinitely preservative power of vaccine, from the variolic virus, whether spontaneous or proceeding from vaccination: If, said this physician, new doctrines seem to shake this old opinion of eminent men, which is based on so great a number of facts, it is because diseases very different from variolas have been confounded with this scourge which was so terrible before the time of Jenner. The author, in order to avoid falling into a similar error, establishes, 1st, The characters and nature of natural or inocculated variola: 2nd, Of the bastard variola, varioloïd, &c., of authors; 3rd, Of the spontaneous cow-pox of the cow, communicated from that animal to man; 4th, Of vaccine from man to man, and from man to the cow.

As regards the determination of the characters and nature of variola, it must be known that neither the umbilical form of the pustules, nor the peculiar appearance of the cicatrices, nor the violet redness of the skin at their base, are sufficient to indicate this affection; it is on its progress and on the regular developement of its five periods and of the symptoms peculiar to each, that we must depend. In spontaneous variola, the period of incubation is wanting; in the period of invasion the disease has already become general, and the organization totally disturbed; the air surrounding the patient has already become infected, and the practised physician may detect the peculiar smell attending variola. This very characteristic odour may remain even in the absence of the eruption or the third period, which may be wanting, from what is called by the greatest physicians, *variola sine variolis*. At maturity, the odour is more appreciable; change of character, and other symptoms supervene; intumescence of the skin and areola of the pustules. The odour remains during the period of desiccation, when all the other symptoms subside, and crusts and scales appear.

Every eruption which does not present *all* the preceding characters is not variola.

In the author's opinion, vaccine does not lose its power after a certain number of transmissions.

At the sitting of the 5th of May, M. Sédillot read the second part of his Memoir, in which he comes to the following conclusions:—

1st, That variola has an absolute, unlimited preservative virtue.

2nd, That cow-pox in its transmission from the cow to man assumes the characters of the vaccine virus.

3rd, That the latter by its transmission, however indefinite, loses none of its properties.

4th, That revaccination is inconsiderate and even blameable on account of the fears and doubts which it awakens.

ON LAUREL WATER.*

BY M. PATON.

This water occupies a conspicuous place among those medicines whose action is uncertain. One medical man, for example, has administered twelve ounces of it in twenty-four hours without inconvenience, whilst another considers it poisonous in the dose of a few drachms. Hence it is impossible to employ this medicine with security, although in some cases it appears to be possessed of very active properties: hence also the necessity of examining the various modes of preparing this distilled water. M. Paton's investigations, the principal results of which, divested as much as possible of the technicalities into which the author is unavoidably led by the very nature of his subject, are as follows:—

M. P. first notices, as having contributed to give credit to the variation in the energy of the "hydrolate" of cherry laurel, the difference in its preparation, which, when it was first employed, was made with two pounds of leaves to one pound of "hydrolate," whilst now two pounds are procured from it. The nature of the soil on which the laurel leaves destined for its preparation are found, and their exposure to a hot sun, have great influence on the activity of the preparation; but it is impossible to define it in an accurate manner.

Being desirous of ascertaining whether the different periods of vegetation had a direct influence on the quantity of hydrocyanic acid contained in this water, and to which it owes all its activity, M. Paton distilled leaves taken at different times from the same plants: he commenced on the 15th of June, and concluded on the 30th of August. The proportions of hydrocyanic acid did not vary very considerably: however, he found the greatest quantity in it towards the end of July.

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* *Gazette Médicale de Paris*, Nos. 18 and 19.

* *Journal de Chimie Médicale*, April 1840.

Afterwards, wishing to ascertain how much acid was contained in some laurel water which he had prepared in 1838, he treated it by an excess of nitrate of silver, and obtained from 500 grammes of laurel water a quantity of cyanide of silver representing 8 decigrammes of anhydrous hydrocyanic acid, or 5 centigrammes, one grain, in the ounce.

Of all modes of preparation, that on the open fire appears to the author most advantageous: he rejects, above all, the mode of preparing it by steam, by which he has been able to procure only very inferior products.

M. Paton rejects as false the very commonly received opinion that cherry laurel water undergoes alteration very speedily. Water which had been prepared two years before, yielded nearly the same quantity of hydrocyanic acid as when it was first prepared. It may easily be preserved when well corked, and in vessels, as much as possible, always kept full. This may easily be done by putting it in small bottles.

One of the most frequent causes of the uncertain action of this water, is the dishonesty of those who supply it. Frequently, when hydrocyanic acid has been sought in it, a few traces only have been found.

One of the chief characteristics of a good medicine being to present an uniform composition, laurel water cannot really be designated as such. But is it necessary, as has been proposed, to substitute different mixtures for it? M. Paton is opposed to this: he says it would be depriving Materia Medica of a medicine whose properties are often advantageous; and he proposes, in order to obviate the above mentioned inconveniences, to give it a specific degree of value by which it may easily be appreciated.

He recommends that the laurel leaves be distilled at a stated period, in the month of July, for example: then, that the value of the product be determined by means of nitrate of silver; then, for a second, by pure potassa or soda, nitrate of silver and nitric acid, and the quantity of cyanide obtained will indicate the quantity of hydrocyanic acid; and the physician, knowing exactly the strength of the medicine which he prescribes, will no longer dread the employment of an inert medicine: still less will he have to fear the poisonous effects which have so frequently been observed after the administration of laurel water.

SOLUTION OF BI-CHLORIDE OF MERCURY, IN ITCH.*

In a discussion which arose at the *Société de Médicine* of Paris, on the treatment of scald head, M. Prus called attention to a means which he has often found successful in the treatment of prurigo, a disease frequently very obstinate among the old people whom M. P. attends at Bicêtre. This means consists in the application, morning and evening, of lotions of a gramme of bi-chloride of mercury in a pint of water, to all the parts where the prurignious papulæ exist.

EMPLOYMENT OF CARBONATE OF AMMONIA IN SCARLATINA.†

BY DR. BODENIUS.

English and American physicians have published very curious results concerning the efficacy of carbonate of ammonia in scarlatina. Dr. Bodenius wished to confirm by his own experience the praises bestowed on this medicine, with which he has obtained so much success in a raging epidemic, that he gives as much importance to it, in this kind of affection, as to vaccine for preserving from variola.

His formula and mode of administration are as follows:—

Carbonate of ammonia .	gram 2 to	4·00
Distilled water . .	,,	90·00
Syrup of marshmallow .	,,	32·00

A coffee-spoonful every one or two hours.

It must be added, in order to avoid all mistake, that Dr. B. did not confine his treatment to this only. When the fever was very violent, and accompanied with cerebral symptoms, he administered glysters of very concentrated bran water, with two or three spoonfuls of strong vinegar. When the eruption appeared, he left off these and administered carbonate of ammonia. From the ninth day he ordered a bath every day. After the twentieth day, he allowed the children to take the air.

AMMONIA IN DRUNKENNESS.‡

The property possessed by ammonia of causing the symptoms of drunkenness to disappear, is not yet sufficiently established: it is useful, therefore, to collect all facts which tend to elucidate this subject.

At a meeting of the *Société de Medicine* of Paris, M. Nonat related the history of two cases of drunkenness, successfully treated by ammonia in a draught and in glysters. One of the two patients had been bled, and an emetic had been administered to him: his condition was one of the most serious. Sixty drops of ammonia in two draughts cured him. M. N. saw, at the Hotel Dieu, in the service of M. Caillard, a man who had drunk three pints of brandy; he appeared to be at the point of death. He was made to breathe ammonia, and a glyster of it was administered to him, for he was unable to drink. Numerous evaccuations took place and the patient recovered.

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* *Bulletin de Therapeutique.*

† *Medicinaische Annalen.*

‡ *Bulletin de Therapeutique.*

On this occasion, M. Prus mentioned a case which he had himself observed. A man of sixty years of age was brought to the infirmary of Bicêtre, dead-drunk. M. Prus saw him at nine o'clock in the morning: he prescribed 4 grammes of acetate of ammonia in a glass of water: before ten o'clock had struck, the patient had returned to his usual state.

ON THE EMPLOYMENT OF TORMENTILLA IN MEDICINE.*

BY M. MORIN.

The tormentilla, *potentila erecta, tormentilla erecta*, Linn., which according to Meissner, is composed:—

Of myricine	2
Of cerine	$5\frac{1}{8}$
Of resin	$4\frac{1}{4}$
Of tannin	174
Of tormentilla red	$180\frac{1}{2}$
Of modified red	$23\frac{1}{2}$
Of gummy extract	$43\frac{1}{4}$
Of gum	282
Of extractive matter	77
Of ligneous fibre	143
Of water	64

And of traces of volatile oil,
has been employed in medicine as an astringent. It has been recommended in dysenteria, hemorrhagia, and in all cases where astringents are used: it has just been recommended in the treatment of panaris.

The following observations on the employment of this root is due to M. Morin:—

A servant was attacked with an exceedingly painful panaris: she used this substance, the application of which to the diseased part caused the violent pain which she experienced, to subside: the skin which was smooth, red and tense, changed its state, the swelling was dissipated and the patient recovered rapidly.

In another subject, the panaris was more serious, and was further advanced in progress: the skin was ulcerated at the extremity; a small flaky fleshy part contracted in the sore, was raised above the finger.

An incision in the contraction became necessary, but all the symptoms ceased on the application of tormentilla, and the instrument was not used; the panaris was cured in a few days. By the application of this plant the symptoms disappeared, one after another; the pain was stopped in a manner which was as quick as surprising.

The exhibition of tormentilla in another case of panaris was attended with similar results.

According to M. Morin, the efficacy of this substance, in panaris, is such as entirely to do away with the use of the bistoury in individuals affected with this complaint.

The following is the method of using this plant:—

The tormentilla root is dried by the fire; it is pulverized, and made into a paste with white of egg; this paste is thinly spread on a piece of linen, and the diseased part is wrapped in it: it is necessary to place an emollient cataplasm over the linen to prevent the paste from drying.

ADULTERATION OF CERATE.

Dr. Faucher informs us, 1st, that the cerate sold by druggists is prepared with inferior oils, often of bad quality, and with impure wax; 2nd, that this cerate may be bleached with sub-carbonate of potassa; and 3rd, that, when applied to sores, burns, &c., it often increases inflammation.

To ascertain the bad quality of cerate he points out the following process: a given quantity of cerate is boiled in a sufficient quantity of river water, or better still with rain water (as more pure). Fresh water is added in proportion as it evaporates: after long boiling it is allowed to cool, and is then decanted or filtered; after which operation, it is found that the cerate has lost weight, because the soap is dissolved in the water as well as the carbonate of potassa which is in excess.

Pure cerate, treated in the same manner, will not lose weight. There exist other scientific means of detecting the adulterations of cerate.

ADULTERATION OF MILK.

The authorities of Rheims and Réthel have adopted the plan of weighing milk in order to detect the frauds practised by milk venders, and to punish those guilty of them. This has produced the best results, and the inhabitants have now the advantage of drinking none but pure milk.

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* *Journal de Chimie Médicale*, May, 1840.

EFFECTS OF EXTRACT OF STRAMONIUM IN FACIAL NEURALGY.*

BY DR. WOLFFSHEIM.

In support of the observations recently published by Dr. Droste, the author of this article mentions two cases of facial neuralgy of the right side, which were successfully treated by extract of stramonium.

The subjects were two women: one aged fifty years, married, and without children, in whom menstruation had ceased for more than twenty years; the second, between thirty and forty years of age, of a pale, cachectic complexion, regular in menstruation, and the mother of two children. Both led a very retired and sedentary life, and had long suffered from facial neuralgy.

In both cases, after having tried other remedies to no purpose, Dr. Wolffsheim employed the extract of stramonium according to Dr. Wendelstadt's recipe, and, except a little clogging of the tongue in one of the patients, no narcotic symptom manifested itself. The pain was dissipated from the fourth day.

With one of the patients there was, a few days after, a relapse, which yielded to the same treatment.

Dr. Wolffsheim does not agree with Dr. Droste, who considers that the right side of the face is less subject to neuralogy, than the left, because it is stronger.

EMPLOYMENT OF THE VAPOUR OF ALCOHOL AGAINST THE INSPIRATION OF CHLORINE.

In large bleaching establishments, in the manufacture of chemical products, and in the experiments of the laboratory, it frequently happens that the inspiration of chlorine gas produces very dangerous effects. This danger may be avoided, by breathing the vapour of alcohol, or by swallowing pieces of sugar steeped in spirit of wine.

This remedy had been used for some years with the most beneficial results.

INTRODUCTION OF SULPHATE OF COPPER AND SULPHATE OF ZINC INTO BREAD.

In the *Petites Affiches de Courtray*, for the 12th of February, we read that the authorities of that town, having been informed that poisonous substances were mixed with articles of food, ordered the commissary of police to repair to the houses of several bakers, and, if required, to seize the substances put into bread. In the course of these investigations, four bottles containing sulphate of copper (blue vitriol), sulphate of zinc, &c., were found at the house of a baker. His bread, and other merchandize seized, will be submitted to chemical analysis.

This is not the first time that alarm has been given to the public concerning the employment of ingredients prejudicial to health in the making of bread: but the result of the inquiries has generally been unsatisfactory. This may easily be conceived, and it cannot possibly be otherwise: a physician, either in the exercise of his profession, or by chance, discovers sulphate of copper in bread; he sends information of this fact to a journal, which, doubtless with a good intention, publishes the fact; the physician and the detainer of the bread, being called upon by the authorities, do not wish to be made informers, and refuse to give up the baker, who, in the meanwhile, removes every thing calculated to compromise him, and justice is thus defeated.

EXHIBITION OF SMALL DOSES OF SULPHATE OF COPPER IN HOOPING-COUGH.

In a letter addressed to the Editor of the Lancet, Mr. P. C. Chavasse, author of "Advice to Mothers on the Management of their Offspring," calls the attention of the medical profession to the great value of small doses of copper, in hooping-cough. He has used it in a great number of cases, and with the most beneficial effects.

The form which he generally orders is as follows:—

Sulphate of copper, ½ gr.;
Syrup of poppies, ʒss;
Aniseed water, ℥iss; M.

One or two teaspoons (according to the age of the child), to be taken every four hours.

NEW MODE OF DETECTING THE ADULTERATION OF FLOUR.

BY M. SELLIER.

The following, which has already appeared in several daily papers, we are nevertheless induced to present to our readers, considering that its importance will be a sufficient apology for our so doing:—

"An ingenious and scientific gentleman in Paris, M. Sellier, who, it may be recollected, some time ago pointed out the intimate connection existing between sound and electricity, having had his attention called to the subject of the adulteration of flour by its admixture with the fecula of potatoes, has been so fortunate, in some recent experiments, to hit on a means which, with very little practice, may be made use of by any one for the purpose of detecting the presence of fecula in flour, and showing the actual extent to which the fraud has been carried. M. Sellier's process is as follows: he takes a plateau or board of a flat surface, over which a coating of common sealing-wax has been laid, and charging part of the surface with positive and part with negative electricity, by means of a Leyden jar, he throws on it, through a barber's puff or small bellows, a quantity of flour, when, if the article be mixed or adulterated even to a fifteenth part, the flour is completely detached from the extraneous matter, and attracted by the negative electricity, and the fecula by the positive. The appearance described on the waxed board by the fecula is what is known to men of science as Lichtenberg's figures. The difference between flour and fecula is so great, when examined through a microscope or magnifying glass, the flour retaining its dead opaque white appearance, while the fecula exhibits a variety of transparent particles, that the most unpractised eye needs but a short time to distinguish the one from the other."

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* *Hufeland's Journal.*

NEW AND SUCCESSFUL MODE OF TREATING HYDROPHOBIA, OR CANINE MADNESS.

The following communication to the Editor of *The Times* is of such vast importance that we think it our duty to present it, unabbreviated, to our readers.

To the Editor of the Times.

Sir,—For the following official document, published by command of the Austrian War Department, I am indebted to my superiors at His Imperial Majesty's Embassy in London. I think that at a season when that dreadful, and hitherto irremediable malady, "hydrophobia," is most prevalent, it is a duty to make public its supposed remedy; such being, besides, the philanthropic object of its official promulgators, who have written the original account in a manner to be generally intelligible.

On perusing the document the remedy would not appear, *a priori*, to a medical eye, a powerful antidote; but opinions are nothing in presence of facts, and these facts, I am informed, are briefly the following:—

"A schoolmaster, named Lalie, residing on that boundary of Hungary towards Turkey where the military colonies are located, having the established reputation of possessing a cure for hydrophobia, the Minister of War, to whose department the government of this territory belongs, instituted an inquiry. Two hydrophobic patients were placed under the care of the military medical officers until they despaired of them; they were then intrusted to the care of the schoolmaster, and were cured.

"A liberal remuneration being given to this person, he is to receive adequate rewards if, after two years' exercise of his remedy under medical surveillance, his discovery is proved to be of sterling value.

"The root of which M. Lalie has recognized the efficacy is the *gentiana cruciata*. It is an abundant natural product.

"Treatment in the earliest Stage of the Disease.

"When the first symptoms appear the mouth must be examined, and beneath the tongue the venæ raninæ or sublingual veins will be found turgescent. This turgescence is at first confined to the neighbourhood of the frænum, and it appears under the form of black spots, resembling the heads of flies; but later, the disease having developed itself, the swelling affects the whole veins. The following is the treatment to be adopted at this period:—The tongue to be grasped with a wooden fork and inverted, and the sublingual veins to be opened with a lancet. The tongue being then liberated, the bleeding must be allowed to continue until it ceases of itself. Then is to be given the first dose of the remedy:—

"Three quarters of an ounce ($1\frac{1}{2}$ *loth*) of the gentiana cruciata are to be given as a *maximum* dose; the root being first pounded, and then macerated in water, so as to form a thin paste; this must be repeated every morning for nine days. At the same time the wound is to be treated in the following way: when fresh it is to be washed with spirit of rosemary, and then a poultice is to be applied, composed of two portions of rye-flour and one of juniper berries, mixed with the strongest spirit of wine, to form into a paste. If the wound is closed, it must be opened and scarified.

"TREATMENT IN ADVANCED STAGES OF THE DISEASE.

"When the disease has already reached its most violent paroxysms, the patient being properly secured, one ounce of the root is to be administered, and to do this a strait jacket being put on the patient, two strong men must be employed to overcome his resistance; his mouth must be opened with two wooden wedges, the nasal air passage being hermetically closed until he has swallowed.

"If after three hours the patient's paroxysms continue to recur, an entire root must be introduced into the mouth, and there secured until bitten away and dissolved. The sublingual veins are to be opened at the first lucid interval, and after the bleeding a little broth may be administered. After this, the patients in general take water without opposition, and fall into a gentle slumber for eight or ten hours, and are cured. During sleep mucus is secreted in the mouth, of the consistency of the white of an egg, of a slightly yellow colour; it is very adhesive, and is with difficulty ejected. It is important the patients should be made to throw up this phlegm. This secretion characterizes the first three days of the malady, and great care must be taken to remove it, principally before the remedy is administered.

"When the bleeding has not been sufficient, it may be resorted to again after five days, in violent attacks, and the decoction given when slight relapse has shown itself after nine days; and an aperient after three days' interval is to be resorted to."

The above is a greatly abridged transcript of a very circumstantial document. I must repeat, however incompetent the remedial resources may appear, they may prove effective. The most powerful remedies have not been discovered by *savans*, and the most valuable of our specifics is due to an Indian, who in a paroxysm of ague chanced to slake his thirst in a stagnant pool, in which lay the branches of the cinchona tree, another bitter, though differing so much from the gentians.

I remain, Sir,
Your obedient servant,
Henry Belinaye.

41, King-street, Argyll-place, June, 1840.

[It need scarcely be remarked that the treatment here recommended requires much experience before it can be relied on as a remedy for this hitherto hopeless malady. Opportunities, however, by which the efficacy of this plan may be tried, it is much to be feared, will not long be wanting, at this season of the year; for the shameful manner in which dogs, often of the most worthless description, are at all times suffered to run about the streets of the metropolis is truly frightful.]

To the Editors of the Chemist.

Gentlemen,—I shall feel particularly obliged if any of your correspondents will inform me what composition it is, which, when applied to brass, will almost instantly give it the appearance of bronze.

I have a small quantity of an article called by the maker Chemical Bronze; it is of the colour of white wine, has no peculiar taste or smell, and affords no precipitate with ammonia.

I shall also feel obliged by any of your correspondents informing me how to produce acetate of tin.

I remain, Gentlemen,
Your obedient servant.
A Subscriber.

Limehouse, June 7, 1840.

TO CORRESPONDENTS.

Nota Bene.—*All Communications must be addressed, "To the Editors of the Chemist, care of Mr. Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be post-paid, and sent before the* 15*th of each month.*

R. W. Worksop, Nottinghamshire.—All replies to the question of our correspondent must be regarded for the most part as speculative; for there are no means of ascertaining the changes which take place under such circumstances. We have here two organic bodies acting on each other. Still there can be no doubt that alcohol undergoes decomposition, to a certain extent, especially when we consider that the stomach generally contains animal and vegetable matters, and that alcohol is converted partly into acetic acid and other compounds, as we have frequently found in persons of weak digestion. To trace all the changes which it may undergo in a living animal body, would be an utterly hopeless task.

That part of the alcohol is absorbed into the system, is well known: the blood of persons bled during intoxication (mistaken for apoplexy) frequently gives a strong odour of ardent spirit; it has also been perceived in the brain of persons, whose skulls have been fractured while under the powerful influence of spirituous liquor.

P. H. H.—We shall comply with the request of our correspondent, at our earliest convenience.

We are obliged to A. P. for his valuable suggestion, which shall receive every consideration.

We are not in possession of the information required by Mr. Smith.

"Scheele" will be attended to in our next.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE COMPOSITION OF BILE.*

BY M. BERZELIUS.

I. ANALYSIS OF BILE BY SULPHURIC ACID.

Ox bile is evaporated in a sand-bath, or *in vacuo,* over sulphuric acid, by raising the temperature to + 100° or + 110°, so that the mass may become sufficiently dry to be reduced to powder. Anhydrous ether is then added. This removes all the unsaponified fatty bodies. After being two or three times digested with ether, the powder is dissolved in anhydrous alcohol, which leaves a residue consisting of mucus, of muriate of soda, and of other salts and animal matters insoluble in alcohol, and dissolves, on the contrary, a combination of the bitter principle of bile with alkali, margarate and oleate of soda, the coloring matter of bile engaged in a similar combination, &c. The solution thus obtained is filtered, and the undissolved portion is washed first with anhydrous alcohol, which is afterwards added to the filtered liquor, afterwards with alcohol of 0·85, which dissolves certain substances, and which is laid aside. The solution in anhydrous alcohol is then mixed by small portions, and by stirring, with an aqueous solution of chloride of barium, until a deep green precipitate ceases to be formed: this precipitate is isolated by the filter, and washed with alcohol, which, however, need not be anhydrous. Baryta-water is afterwards added, by drops, to the filtered liquor: the precipitate which is then formed is at first of a deep grey, but it soon acquires a green color: the baryta-water is added until the liquor is no longer rendered turbid by it: the precipitate soon loses its green color; but it becomes brownish yellow, and, at last, yellowish only. It is isolated by the filter, and washed with alcohol of 0·84.

The first precipitate, formed by the chloride of barium, contains the substance which gives bile its green color, combined with baryta: M. Berzelius calls this substance *biliverdine* (from *bilis*, bile, and *verdir*, to become green.) The second precipitate, or that yielded by baryta-water, contains, besides biliverdine, a dark yellow colouring matter, which he calls *bilifulvine*, (from *bilis*, bile, and *fulvus*, dark yellow,) an extractiform matter and a peculiar azotous animal matter.

The alcoholic solutions contains uncombined baryta, which is precipitated by carbonic acid gas: the liquor is filtered and evaporated to dryness. The evaporation is completed *in vacuo,* so that the mass may be dried sufficiently to become hard and brittle. It is then redissolved in anhydrous alcohol, which leaves a residue of chloride of sodium of recent formation, and of chloride of barium. The solution is filtered, and mixed with sulphuric acid previously diluted with half its weight of water, and afterwards with alcohol. The acid is added by degrees, until it ceases to precipitate the bases (soda, baryta, and ammonia) which are in solution in the liquor in the state of sulphates. When, at the end of two hours, the addition of a few drops of acid does not produce any more turbidness in the clarified liquor, or deposit in the vessel, it is separated by filtration from the saline precipitate; the latter is washed with anhydrous alcohol, the filtered liquor is put into a retort with recently precipitated carbonate of lead, which has been well washed and is still wet, and it is distilled in a tubulated retort. The carbonate of lead combines with the sulphuric acid, and partly with the fatty acid. When nearly all the alcohol is driven off, the distillation is interrupted: the pale yellow liquor is separated by filtration from the precipitate of lead. It then contains oxide of lead, which may be precipitated by sulphuretted hydrogen : the sulphuret of lead thus precipitated is separated by filtration and washed with alcohol; the liquor is afterwards evaporated to dryness in a sand-bath.

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* *Annalen der Chemie und Pharmacie,* vol. xxxiii. p. 139.

We then have a yellowish, transparent, brittle mass, in the dry state, which, heated *in vacuo* to a temperature of from + 100° to + 110°, loses the remainder of its water, swelling up and leaving a white turgid mass: the latter is quickly pulverised, and treated by a little anhydrous ether, which is poured on it by degrees, and which is decanted off after having acted for some time; the ether dissolves the uncombined fatty acids, and a small quantity of a principle which will be spoken of farther on. The powder remaining is disembarrassed *in vacuo*, over sulphuric acid, from the ether which it still retains, and in this state it represents the bitter electro-negative principle of bile, as pure as it can be obtained.

This body, which M. Berzelius calls biline, (from *bilis*, bile,) possesses the following properties :—It is under the form of a soft transparent mass, of a light yellow, or colorless, inodorous, and of a less bitter taste at the tip of the tongue than at the root of that organ or the pharynx, and which, in that respect, resembles the bitter taste of the *abrus precatorius*. At the same time, the taste is rather sweet. Heated to a temperature somewhat exceeding + 100° C., it becomes slightly turgid, without undergoing any alteration; heated to a higher degree, it turns brown, swells up, becomes semifluid, inflames and burns with a resinoid, fuliginous flame: there remains a bulky carbon, which burns without residue. By dry distillation it gives ammoniacal products. It is soluble in water and in alcohol in all proportions, and insoluble in ether, which precipitates it from its alcoholic solution, under the form of a magma. It is identical with the biliary sugar of Gmelin, but it exhibits no crystalline texture, a circumstance which, in Gmelin's experiments, depended on a mixture of acetate of soda.

Biline has so great a tendency to undergo alterations, and to form an acid body, that even that which remains after the evaporation of the alcohol *in vacuo*, exerts an acid reaction on turnsole paper, and that its aqueous solution gives, with subacetate of lead, or with a little uncombined oxide of lead, a small quantity of an emplastic mass; this combination occurs more especially when the liquor is evaporated in the sand-bath.

Its aqueous solution is not precipitated either by acids, not even by tannic acid, nor by chlorine gas, nor by the alkaline, earthy, or metallic salts: but if much hydrated or carbonated alkali be mixed with it, there is separated a semifluid combination of alkali and biline, which is insoluble in the alkaline liquor, but which immediately dissolves in anhydrous alcohol: whence it results that biline has, in general, an affinity for bases and the oxides, but that the solubility of the combinations in water causes reactions to be wanting.

The tendency of biline to undergo alteration is singularly increased in activity by acids, aided by heat. The mineral acids have much more power in this respect than the vegetable ones; they decompose it so completely, that nothing more of it remains. With the latter, the alteration is incomplete, but much more advanced, however, than that produced by only water and heat. The mineral acids precipitate from it great part of the products of the change which it undergoes; the vegetable acids hold them in solution, or, at least, do not in any way impede their solubility in the liquor. In this change biline is decomposed into several products. These are, *ammonia*, *taurine*, *fellic acid*, (from *fel*, bile,) *cholinic acid*, (from χολη, bile,) and *dyslysine*, (from δυς, difficult, and λυσις, solution.) We need not follow M. Berzelius through all the details of the preparation of these products: we will confine ourselves to pointing out their principal properties :—

Taurine is white, in small crystals, and soluble in water.

Dyslysine is a resinoid body, very little soluble in boiling alcohol, even when the latter is quite anhydrous.

Fellic acid is white and inodorous, and has a bitter taste; it melts, at above + 100° C., into a transparent mass, which allows much water to be disengaged, and becomes hard after cooling. Heated more powerfully, it swells up, inflames, and burns like a resin, leaving a bulky carbon, which consumes without residue. Submitted to boiling with water, it fuses into a white transparent mass, and dissolves in a certain quantity of water, which, after evaporation, leaves it under the form of transparent drops in the vessel. The aqueous solution reddens turnsole paper, and has a slightly bitter taste. It is very soluble in alcohol even when diluted; the solution reddens turnsole paper, and has the characteristic bitter taste of bile. It is more soluble in ether than in water, but less than in alcohol. With the alkalies it forms salts, which are soluble in water and in alcohol, but insoluble in ether, and which are completely precipitated by an excess of carbonated or caustic alkali: the precipitate is emplastic. These salts have the bitter taste of bile, without any sweet taste. Chloride of barium forms an emplastic precipitate in the aqueous solution of the alkaline fellates.

Cholinic acid is easily fusible, insoluble in water, very soluble in alcohol, and, to a certain degree, soluble in ether. The alkaline carbonates form with it combinations of an appearance similar to that of swelled up gelatine, very little soluble in water, but very soluble in alcohol. It does not readily combine with the caustic alkalies except in its alcoholic solution: the combination is then soluble in alcohol and in water. The salt of baryta forms in the alcoholic solution of the alkaline cholinates, a precipitate which is not emplastic.

Biline combines in two proportions with fellic acid, and perhaps also with cholinic acid: M. Berzelius calls the completely saturated combination, bilifellic acid.

But are these acids really contained in bile? or, indeed, are they products of the analytic treatment? The analysis of the salts of lead will furnish an answer to these questions.

II. ANALYSIS OF BILE BY THE SALTS OF LEAD.

From this analysis M. Berzelius draws the conclusions that bile really contains fellic and cholinic acids, and that the alteration of biline has begun in the body; but it appears to have followed an unequal progression owing to circumstances and conditions also unequal: it may be altogether wanting in certain cases, and, in others, it may be far advanced before the extraction of the bile. We have not therefore any reason to presume that in bile, biline bears a necessary and determined chemical relation to the fellic and cholinic acids.

ACTION OF ACIDS ON BILE.

We have seen that all the acids precipitate mucus from bile: after its separation we may add to recent bile as much sulphuric or hydrochloric acid as we like, without precipitating anything from it. If sulphuric acid, diluted with five or six times its weight of water, be added to the alcoholic extract of bile, it completely dissolves it, and the liquor is not turbid even at the expiration of 48 hours; it may be diluted with any quantity of water without becoming turbid; but if it be submitted to digestion, it very soon begins to deposit at the bottom of the vessel a thick, greenish liquid, which at first has a syrupy consistence, but which always becomes more fluid by prolonging the digestion. When the liquor is left to cool, after a couple of hours, a fatty mass, fluid when heated, floats on the surface, and may be removed; it is a compound of fatty acids, fatty matters, and cholesterine.

The deposit formed at the bottom of the vessel is bilifellic acid; at the same time, it contains a chemical combination of sulphuric acid with biline; it is M. Demarçay's choléic acid: if the digestion be continued, the biline of the two combinations is decomposed, and in the end there remains nothing but two resinous acids.

ALTERATION OF BILE BY BOILING WITH ALKALIES.

M. Berzelius boiled for some hours an aqueous solution of the alcoholic extract, with a solution of carbonate of potassa: he now and then diluted the mixture with a little water, whenever it commenced to deposit the combination of biline with potassa; he afterwards concentrated it sufficiently to effect the deposition of this combination. The colourless alkaline solution was then decanted, and the combination of biline and potassa dissolved in water and precipitated by acetic acid. Thus he obtained a white, light, crystalline precipitate, which he collected on a filter, washed with water, and dried. It was presented under the form of a shining mass, formed of an agglomeration of fine crystals, which quite agreed with the description of cholic acid given by Gmelin.

ALTERATION OF BILE BY LONG KEEPING.

Bile has a great tendency to putrify: this is owing to the mucus which it contains, and which seems to determine its alterations by a catalytic power, since they do not occur after the separation of the mucus. The products which are formed therefore have again to be examined.

A medicine, known by the name of *thickened ox-gall*, is prepared by evaporating ox gall in the sand-bath. It is frequently a year before it is used, and during that time it undergoes a slow change, which seems different from that produced by the acids. M. Berzelius examined some of this bile which had been kept for eight months.

It was semifluid, resembling a thick brownish green syrup, of a disagreeable, but not exactly putrid odour; it disengaged white vapors on the approach of a glass rod dipped in nitric acid. It was thoroughly dried in the sand-bath, treated by ether to remove the fatty matters, and afterwards dissolved in alcohol. This solution was treated by chloride of barium and afterwards by baryta water, in the manner above indicated. They separated the coloring matters and left a pale yellow solution, from which the alcohol was driven off by distillation. The alcoholic extract was dissolved in water and precipitated by acetic acid, which gave an abundant emplastic mass. The liquor precipitated by acetic acid left also, by evaporation to dryness, a portion of biline, which bore very small proportion to the quantity of bile employed. M. Berzelius found in the emplastic mass two new acids, one which he calls *cholanic acid*, and another which he designates by the name of *fellanic acid.*

CHOLANIC ACID.

After desiccation it is white, earthy, inodorous, and insipid; it melts only at a temperature much above 100° C., and then disengages a small quantity of water. It becomes a transparent colorless mass, burns like a resin, and passes over by dry distillation under the form of a thick oil with an empyreumatic odour, leaving a little carbon in the retort. The distilled oil reddened turnsole paper. When boiled with water this acid melts, and is soluble only in a very slight degree. The water is rendered slightly turbid by cooling, and cannot be clarified: it exerts a scarcely perceptible action on turnsole paper. Alcohol dissolves it with difficulty when cold, but easily with heat, and by cooling some crystalline portions are deposited. When left to spontaneous evaporation, however slow, cholanic acid is deposited under the form of a colorless, transparent, resinoid body. It is but little soluble in ether. It deposits under an earthy form from the ethereal solution evaporated in the open air, but if the vessel be covered with a bit of glass, and the evaporation very slowly carried on, it remains under the form of crystals.

It is a very weak acid; but it drives off carbonic acid from the alkaline carbonates, and is dissolved. Its combinations with the alkalies have a bitter taste; after evaporation they are colorless, resembling gum, and easily soluble in alcohol and in water. The alkaline carbonates added in sufficient quantity to their solution, completely precipitate them. The ammoniacal salt is decomposed by boiling with water, so that the acids precipitate nothing from the filtered liquor. The barytic salt is earthy, insoluble in water, and but little soluble in alcohol of 0·84.

Cholanic acid, boiled for a long time with an excess of caustic potassa, does not undergo any alteration; but if it be boiled with hydro-chloric acid, without appearing to be in the least changed, it gives a body which is different with respect to its properties, which does not any longer combine with the alkalies, and which dissolves, only in very small quantity, in boiling alcohol: this solution does not become turbid by cooling, but leaves, by spontaneous evaporation, a white earthy body, similar to that which remains after the spontaneous evaporation of a solution of dyslysine.

FELLANIC ACID.

Precipitated by the acids from its saline solutions it forms white unagglomerated flakes, which melt by heat into a colorless liquid, which solidifies and becomes semi-transparent by cooling. After desiccation the precipitate forms a white earthy mass. This acid is inodorous and insipid: by dry distillation it passes over under the form of an unsolidifiable oil, and leaves a light transparent layer of carbon in the retort. It is very little soluble in cold, but more so in boiling water; in the latter, by cooling, a very distinct white cloud is formed, and, at the end of a few days it allows a very dense white precipitate to deposit, without becoming perfectly clear. It readily dissolves in alcohol, from which it is deposited in crystals by very slow evaporation. It dissolves only in very small quantity in ether, and is deposited from it in groups of soft needles, when the solution is left to very slow evaporation, as, for example, in a deep vessel covered with a piece of glass. All its solutions in these solvents redden turnsole paper. With bases it forms peculiar salts; it dissolves with vivid effervescence in the alkaline carbonates, and is not precipitated by an excess of them. Its alkaline salts are transparent, resembling gum, and become brittle by desiccation. They have a bitter taste, rather sweet at first. The ammoniacal salt, when completely dried in the sand-bath, gives with water a clear solution. The barytic salt is rather soluble in water, and deposits by cooling from a solution saturated by boiling, in crystals as light as feathers; it is in the alcoholic solution more particularly that it crystallizes regularly in colorless transparent prisms. If the alcoholic solution be evaporated by heat, the salt is deposited under the form of an oil, which solidifies by cooling; but in a short time, points of crystallization appear on the surface, and soon extend farther, and the whole mass ultimately becomes a heap of radiated crystals.

It follows, therefore, that bile inspissated, but not completely dried, is continually undergoing a progressive alteration, which gradually diminishes the quantity of biline. The products of which we have been speaking are then formed, and also some others. As biline begins to undergo alteration in the gall bladder, it is probable that this change is of the same nature as that which thickened ox-bile experiences, and in this case recent bile also should contain fellanic and cholanic acids: but M. Berzelius has not yet succeeded in assuring himself of this.

From the preceding it results that bile, especially when in the recent state, contains a combination of biline, bilifellic acid, cholinic acid, fatty acids and biliverdine with alkali. To this combination its odour, taste, and chemical properties are owing. It contains also other substances in small quantities.

We may conclude this extract with some of the author's considerations concerning the different principles of bile.

FELLIC ARD CHOLINIC ACIDS, AND DYSLYSINE.

These bodies constitute what may be called the resin of bile. The substance to which M. Thenard gave this name was no other than a mixture of bilifellic and cholinic acids with fatty acids and with the green coloring matter of ox bile. Its picromel was a combination of bilifellic and cholinic, and fatty acids. Gmelin has shown that biline may be extracted from M. Thenard's resin of bile. That which Gmelin described as resin of bile was a product of the decomposition of biline, and was formed of fellic and cholinic acids, and of dyslysine.

BILIVERDINE.

This substance possesses the following properties: it is of a brownish green, pulverulent, inodorous, and insipid; it is destroyed by calcination, without melting and without giving any ammoniacal products, but leaving much porous carbonaceous residue. It is soluble in water: the caustic and carbonated alkalies readily dissolve it with a green color, and the acids precipitate it in flakes of a deep green. Dissolved in carbonate of ammonia, and left to spontaneous evaporation, it parts with the ammonia and becomes insoluble in water. By double decomposition it may be combined with other bases. Its tint varies: in some bile it is of a grass green. This substance is soluble in alcohol, but in small quantity, and is not precipitated from it by water: the latter gives a yellowish green color to the solution. A concentrated alcoholic solution is almost red, when looked *through:* ether also acquires a red color in dissolving it: the solution is very deep, although it contains but very little of it. It combines also with the fatty acids, which it turns green; it colors, under favorable circumstances, different animal substances, green or yellow: this coloring requires but an extremely small quantity of biliverdine. Sulphuric and hydro-chloric acids dissolve it with a fine green color, and concentrated acetic acid with a red color. It is very soluble in these acids. Nitric acid precipitates it from its combination with alkalies like other acids: if an excess of nitric acid be added, it is gradually destroyed and the solution is yellow.

These properties of biliverdine agree in all respects with those of chlorophylle: M. Berzelius is therefore disposed to consider them identical: he has likewise obtained it from bile with the three modifications of chlorophylle. The properties which have just been described naturally apply only to ox-bile: perhaps, indeed, they belong also to that of other herbivorous animals; but in that of carnivorous animals it has totally different properties, or, indeed, is combined with another coloring matter, from which it has not yet been possible to separate it.

ON RENNET.*

BY M. DESCHAMPS.

The rennet used for curdling milk is prepared by various processes: it is most frequently made with the stomach of the calf; sometimes, however, the mucous membrane of the stomach of the pig is used.

If we refer to books to learn what rennet is, we read that the matter which is found in the stomach of ruminating animals is thus called: or else, that rennet is that which is used for curdling milk, as the acid liquor which comes from the ventricle of calves, kids, &c., because it thickens and curdles milk. M. Berzelius, without withdrawing the name of rennet from the stomachal cheese (*fromage stomacal*) of the calf, applies it to the mucous membrane of the stomach, and thinks that this membrane contains a peculiar matter which curdles milk.

This difference of opinion—the remarkable action of rennet—its activity attributed by some to the acid which it contains, and by others to a peculiar matter—induced me to make a series of experiments with the view of discovering, if possible, the active principle of rennet.

I prepared liquid rennet with alcohol at 27° C., and a calf's stomach: eight drops of it were sufficient to curdle a quart of milk.

Some of this rennet was distilled in a retort. The result was gathered in a receiver cooled by a current of water. The distilled product was rather acid; it had the odour of rennet. The residue was thick and very acid; its odour was that of toasted Gruyere-cheese.

I put 750gr. of milk into three vessels. I poured into the first, five drops of the distilled product; into the second, five drops of the residue; and into the third, five drops of each: nothing was produced.

I exposed to the sun, in the month of June, rennet contained in a flask; it became thick, and lost its action on milk.

I evaporated 30 gr. of it to dryness over sulphuric acid, and I obtained a very powerful rennet.

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* *Journal de Pharmacie*, June, 1840.

Eighteen drops of rennet, poured into 125 gr. of boiling milk, produced no effect.

I mixed 15 drops of rennet with 125 gr. of cold milk, and boiled it rapidly; the milk underwent no alteration.

Rennet was saturated with calcined magnesia, and three drops coagulated 250 gr. of milk.

I rendered rennet alkaline with a solution of bicarbonate of soda; this liquor poured into milk coagulated it.

I put some rennet into a matrass, and heated it in a sand-bath: it began to lose its transparency at 45° C., and the turbidness increased until 60° C. Three drops heated to 45° C., and eight drops heated to 50° C. separately curdled 125 gr. of milk. The coagulation was slower with rennet heated to 50° than with that heated to 45° C.: the slowness of the operation is indicated by the cream which separates. A spoonful of rennet, heated to 60°, did not affect 125 gr. of milk.

In order to ascertain what part of the calf's stomach it is that produces the rennet, I dissected the mucous membrane of a stomach, and I put the serous membrane, together with the muscular membrane, in 300 gr. of alcohol, at 27° C.: after three months' maceration, I mixed, without any result, 20 gr. of this liquor, with 125 gr. of milk. The cheese was wrapped in a cloth, and put in 300 gr. of alcohol, at 27° C. After one month's maceration, the liquor was only very weak rennet. The mucous membrane was put in 130 gr. of alcohol at 27° C. After a month's maceration the liquid acted as a weak rennet; it required twenty drops to curdle a quart of milk. I put a little chloride of sodium in the flask, and obtained a powerful rennet: one drop coagulated 170 gr. of milk.

The mucous membrane of a calf's stomach, which had been macerated in 375 gr. of alcohol, at 27° C., and which had produced a weak rennet, was taken out of the flask after one month's maceration, and was washed and put into a flask with alcohol at 27° C., and 6 gr. of salt; next day three drops coagulated 250 gr. of milk.

The mucous membrane of a calf's stomach was exhausted by alcoholic and aqueous maceration.* The former were made with 800 gr. of alcohol at 27° C., and lasted seven months. The latter were continued with 8000 gr. of water, and lasted only twelve hours each. After this time, the mucous membrane was dried; it did not redden blue turnsole paper, when the latter was applied to its inner and moist surface. One part of this dried membrane was put into 1800 parts of unskimmed milk, and the temperature was raised to 50° C.: at 45° the coagulation was complete. The membrane was separated, washed, dried and weighed: there was no loss. This membrane was again put into a quantity of milk equal to the first; the milk was heated to 50° C.; and, as should be, there was no action.

Boiling milk was not altered by the exhausted mucous membrane.

After having ascertained that the active principle of rennet was produced by the mucous membrane of the stomach, I endeavoured to ascertain whether another part of the digestive tube did not contain it, and whether this matter were peculiar to mammiferous animals. From these investigations it results that this matter is not contained in the other parts of the digestive tube;† that it does not exist either in the craw or the succenturial ventricle of gallinaceous birds, but that it does exist in their gizzard; that it belongs to the stomach of all animals,‡ and that its functions are essential to digestion, for they promote chymification.

Liquid rennet is of a light amber, when it has been prepared with a calf's stomach and alcohol at 27° C. Its odour is buttery; its action on test papers is acid. When it is saturated, it becomes thick and disengages ammonia. If, after having saturated rennet with diluted ammonia, it be filtered, a transparent liquid, which has the odour of rennet, is obtained; it has no action on milk: six spoonfuls did not cause any alteration in milk. If the filtered liquor be left in a corked flask, there are deposited on the sides of the flask, small crystalline grains composed of ammoniacal phosphate of magnesia. The filtered liquor was acidulated with tartaric acid introduced into a retort, and distilled in order to obtain 500 gr. of product. These 500 gr. were saturated with ammonia, and distilled to obtain 250 gr. The residue was neutral; tartaric acid was added, and the distillation was continued. These two products were saturated with potassa, and evaporated; they contained, the first capric acid, and the second caproic and butyric acids. In another experiment, the first distillation was continued in such a manner as to have a greater quantity of liquor, and the first product of the distillation contained capric and caproic acids, and the second butyric.

The rennet contained :—

Hydro-chloric acid in very large quantity.
Butyric acid.

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* This experiment differs from that of M. Berzelius.

† I have however remarked the action of this matter with the portion of the duodenum which precedes the *ductus communis choledochus;* but this evidently arose from the duodenum having been cut too near the pylorus.

‡ I generalise only by induction.

Caproic acid.

Capric acid.

Lactic acid.

Chloride of ammonia.

Chloride of sodium, independent of that which was added: the chloride added increased the secretion of chloride of ammonia.

Magnesia, not in the state of ammoniacal phosphate of magnesia.

Soda, probably with magnesia, in the state of lactate.

Traces of sulphate.

Phosphate of lime.

And a peculiar matter, which I call *chymosine*, from χυμος, chyme, χυμωσις, chymification.

In order to obtain chymosine in the rough state, a slight excess of ammonia is poured into rennet. The precipitate is filtered, washed, and dried. Dried chymosine resembles gum or emulsin. It is insoluble in water; its insolubility is so great, that even after an immersion of some hours, it may be pulverized under that liquid; but it is soluble in acidulated water. This solution possesses the property of coagulating milk. Hydro-chlorate of chymosine was precipitated by ammonia, acidulated with hydro-chloric acid, then saturated with ammonia until the liquid began to become thick: notwithstanding these repeated operations, it still curdled milk.

This solution is not so strong as rennet, that is to say, the quantity of chymosine extracted from a given quantity of rennet cannot reproduce a similar quantity of the latter. Its action proves only that this property is not extinct in isolated chymosine.

Water, acidulated with sulphuric acid, separates from chymosine the phosphate which is precipitated with it.

The solution of chymosine is precipitated by all the alkalies, the carbonates of potassa, soda, and ammonia, and by tannin.

Iodic acid is decomposed and iodine set free, when it is poured into this solution.

Chymosine burns with a flame, and leaves a shining carbonaceous residue.

From the above I think I may conclude:—

That rennet is a fit name for the mucous membrane of the stomach:

That rennet may be concentrated without being altered:

That the action of rennet on milk is not attributable to the acid it contains, because it acts even after it has been saturated, because the heat of the solar rays, and a temperature of 60° C., deprive it of this property, and because heat exerts on the mucous membrane an action similar to that which it exercises on rennet:

That chymosine is the active principle of rennet:

That the action of isolated chymosine cannot be attributable to the acid used to dissolve it:

That chymosine is secreted only by the mucous membrane of the stomach:

That the stomachal cheese (*fromage stomacal*) performs the functions of rennet only because it is impregnated with chymosine:

That the proportion of chymosine required for coagulating 1000 gr. of milk is excessively small, since that quantity may be curdled with eight drops of liquid rennet, and since part of the mucous membrane of a calf, perfectly exhausted, at 45° C., of temperature, coagulated 1800 grammes of milk:

That the acidity of rennet favours its action:

That a temperature of 20 to 25° C., is very favourable to the action of rennet:

That chloride of sodium acts as a stimulant on the mucous membrane, and that this action increases the secretion of chymosine:

That the action of chymosine cannot yet be explained; and that in saying that the caseous matter undergoes an isomeric alteration by the action of rennet, or that the action of rennet is carried on by virtue of the catalytic power, is, without accounting for phenomena, only making use of expressions to which the mind is accustomed.

I have given the name of *chymosine* to the matter secreted by the mucous membrane of the stomach, because this name relates only to chymification, or the first part of digestion: whilst the word *peprine*, on the contrary, relates to the entire digestion, namely, to chymification and chylification; and because we see the food transformed into chyme, whilst we cannot see the passage of chyme into chyle.

If it were permitted to us to apply to the organs of living animals the observations made after death on those same organs, it would be easy to explain otherwise than at present some parts of the phenomena of digestion.

When the animal introduces nutritive matters into its mouth, the digestive apparatus is excited, the saliva runs out, and, during mastication, is mixed with the alimentary matters, and renders them alkaline. Mastication being finished, these matters penetrate into the stomach, and meet with the gastric juice, which transforms the uncombined soda of the saliva into chloride of sodium. This chloride acts on the mucous membrane of the stomach as a stimulant, and augments the secretion of chymosine, which is dissolved in the excess of hydro-chloric acid, which the gastric juice contains. The matters accumulated in the stomach are agitated by the motions of that organ, penetrated by the gastric juice, and insensibly transformed into chyme, under the influence of temperature, of chymosine and of its solvent.

This operation terminated, the chyme passes through the pylorus, and is mixed in the duodenum with the pancreatic and biliary juices, which necessarily modify the chylous matter, before presenting it to the chylous vessels. If a morbid affection changed the nature of the secretion of the mucous membrane of the stomach, chymosine would not have any action; for it would meet, if it were secreted, only a liquid capable of precipitating it, and digestion could not be conveniently carried on. If, on the contrary, the acidity of the gastric guice were too great, this liquid would have too powerful an action on the mucous membrane, and the animal would be fatigued, &c.

It is true that this theory does not account for all the phenomena of nutrition; but it explains, in a more probable manner, the action of the saliva in digestion, for it appears to me impossible to admit as a principle, that the uncombined soda acts as solvent of the nutritive matters, since, in man, for example, the food remains but a short time in the mouth, and arrives, without stopping, in the stomach, where it meets with an excess of hydro-chloric acid which does not allow it to remain free. In animals which, like ruminating animals, have several cavities in which the food remains for a time, this mode of considering it would be the easiest to sustain: but it may easily be conceived, that the nutritive matters of these animals being hard to digest, it was necessary to delay their entering into the stomach, and that they were obliged to be well-divided and well-softened, in order to present to that organ matters easily transformed into chyme, and that these macerations would not be sufficient to sustain the solvent system, when indeed even the solution of albumen is relied on, for this solution is obtained, in the experiments of the laboratory, without the presence of an alkali.

In gallinaceous and other birds, the nutritive matters remain for a long time in the craw, stay again, before passing into the gizzard, in the succenturial ventricle, and in this course, meet only an acid liquid.

This theory, which is corroborated by our use of sea-salt in food, by its well-established digestive action, and by the presence of hydro-chloric acid, and of chloride of sodium in all stomachs, in an indirect manner, explains the action of bicarbonate of soda in bad digestions; for this salt acts by its acid, by its base, and by the chloride of sodium which is formed, and not by its solvent action, for it is not more probable than the solvent action of saliva in mastication.

AFFINITIES OF OXYGEN AND HYDROGEN FOR CERTAIN BODIES.—ELECTRO-CHEMICAL DECOMPOSITION OF WATER.*

BY M. EDMUND BECQUEREL.

M. E. Becquerel read the following extract from a Memoir entitled: *Investigations concerning the electro-chemical decomposition of water.*

When we subject to the decomposing action of the pile, water holding in solution substances which have an affinity for oxygen or hydrogen, these substances aid in its decomposition. If, for example, we pour it into a vessel of water holding chlorine in solution, and if we steep in it two platinum electrodes, in connection with a small Wollaston's pair, of 4 centimetres square, and feebly charged, the water is immediately decomposed; the oxygen only is disengaged at the positive pole, whilst the hydrogen, at the other electrode, is combined with the chlorine, forming hydrochloric acid: a small quantity of oxygen is absorbed, as we shall see farther on. But if, instead of employing a single pair, three or four, or a number sufficient to decompose the acidulated water, be taken, hydrogen is then disengaged at the negative pole, as may readily be conceived: in this case, the quantity of hydrogen is such that it does not meet with, at the moment when it is in the nascent state on the sheet of platinum, all the chlorine necessary for forming hydro-chloric acid, for it requires some time for the chlorine to come from the different parts of the liquid. This experiment shows that water may be decomposed with a single small ordinary element—a fact which has never before been observed. Nevertheless, it was known that, in peculiar circumstances, as in the simple apparatus for the disengagement of oxygen, such as that which M. Becquerel, sen. invented, the simple action of nitric acid on potassa produced an electric current capable of decomposing water. If we dissolve in water, salts whose bases may become superoxidized, such as the sulphate of protoxide of iron, the solution is again decomposed with a single couple; in this case, there is a disengagement of hydrogen only at the negative pole.

These principles will serve us for comparing the energy with which these substances combine with one another. We operated in the following manner:—

We first took two vessels, each fitted with two platinum electrodes: two of these electrodes communicated with each other, and the two others were put in communication with the poles of a battery: one of the vessels contained chloruretted, and the other, acidulated water. By taking successively two and three couples of the pile charged with acidulated water, there was no disengagement of gas in the two vessels. With four couples, the acidulated and chloruretted waters were decomposed. With the latter, there was, as above, a disengagement only of oxygen; but by increasing the number of couples, hydrogen began to be disengaged in the chloruretted water. On examining the results comprised in my Memoir, it was evident that, in the vessels containing chloruretted water, not only was hydrogen absorbed, but also some oxygen. This effect was easily recognised by collecting the disengaged gases, for, according to Mr. Faraday's principle, the same quantity of water ought to be disengaged in both vessels.

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* *Société Philomatique de Paris;* sitting of the 13th of June, 1840.

Four vessels were afterwards taken similar to the preceding, and communicating together in such a manner that the current of a pile passed equally into the four vessels. In the first was put chloruretted, in the second, bromuretted, and in the third, iodized water. The fourth, containing acidulated water, was used as a voltameter. An electric current was then passed into this system, and the absorption of the gas disengaged in these different vessels was measured. Similar results may be obtained by taking solutions of chlorine, bromine, and iodine in such a manner that these bodies may be in equal atomic proportions, by employing only weak currents, and by taking other precautions mentioned in my memoir. The following numbers represent the proportions of absorption of hydrogen and oxygen by chlorine, bromine, and iodine:—

Absorption of hydrogen by	Chlorine	922
	Bromine	712
	Iodine	212
Absorption of oxygen by	Chlorine	169
	Bromine	380
	Iodine	469

As the greater affinity the bodies dissolved in water have for hydrogen and oxygen, the greater is the quantity of gases absorbed, it follows that these numbers show the energy with which the gases that enter into the composition of water combine with chlorine, bromine, and iodine. It would be curious to ascertain whether these numbers are the same as those found by my father's process for measuring the affinities of bodies for one another.* However, I present these results only as pointing out a process by which to compare the affinities of certain bodies for each other.

In the second part of my memoir I have given the study which I made concerning the action of spongy platinum and gold on oxygen and hydrogen, when those substances act as the electrodes of a pile. I have ascertained that these two bodies absorb the gases in nearly the same proportions, and that the proportion of the absorption of the hydrogen is to that of the oxygen as 2·5 to 1, or thereabouts.

PECTINE, PECTIC ACID.—FERMENTS.†

BY M. FREMY.

At a sitting of the *Société Philomatique de Paris*, held on the 16th of May, 1840, M. Frémy read the following note, relating to communications which he made verbally to the Society at the preceding meeting.

I had the honour of communicating to the Society at its last sitting a summary of my investigations concerning pectine and pectic acid. In my work I have shown that these two bodies differ only in their capacity of saturation, and that they have the same elementary composition. Pectine may be converted into pectic acid under the influence of a ferment found in all fruits, and in some roots. I think I have shown that this transformation explains certain phenomena which have been observed in the ripening of fruits. Pectic acid may also, under the influence of alkalies in excess, be changed into a new acid, which I call *metapectic*, and which differs from pectic acid in its capacity of saturation, which is more powerful. These different substances are of remarkable instability, and frequently undergo an alteration in water: I have termed them *bodies of transition* (*corps de transition*). Indeed, I think that an organic substance, before arriving at a fixed state, must go through a series of successive modifications. It is a series of this nature that I considered in my former work.

In the second place, I communicated the conclusion of the experiments on ferments, undertaken by M. Boutron-Charlard and myself. We were enabled very accurately to ascertain the circumstances and agents which determine the formation of lactic acid. All the animal matters which act as ordinary ferments may, in time, undergo a modification which gives them a new and more energetic power. They acquire, indeed, the property of transforming into lactic acid, not only sugar, but also dextrine, gums, starch, &c. The action of animal matters is neutralized when they are subjected to a temperature of 100° C. We hope that the examination of these phenomena will enable us to explain the formation of acids in vegetation: it has already led us to a very easy process for preparing lactic acid, which acquires, as every one is aware, importance from its new applications in medicine. It is well known that cross-spired barley contains a principle capable of converting starch into sugar, which is called diastasis: barley contains, moreover, a very large quantity of an animal matter, which may form lactic acid by undergoing certain modifications. We take cross-spired barley and slightly damp it, and keep it for three or four days in a corked flask. During this time, the animal matter contained in the barley is modified, the temperature raised, and if the barley thus acted on were submitted for two or three days to water at 40° C., the water became very sour, and contained a very considerable quantity of lactic acid. It is evident that in this case the diastasis transforms the starch into dextrine and sugar, which are immediately converted, under the influence of the animal matter, into lactic acid.

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* See *The Chemist*, No. VI, page 164.

† *L'Institut*, No. 335.

ON THE PRECIPITATION OF CERTAIN METALLIC OXIDES BY WATER.*

BY H. ROSE.

In a memoir which I published a short time ago, I compared the formation of ether by a mixture of sulphuric acid and alcohol, to the decomposition of several inorganic salts by the intermedium of water. I endeavoured to give probability to the opinion which admits that it is water, which in these cases performs the function of a base, and separates the oxide of ethyle or the metallic oxide, the latter in the state of an ordinary basic salt.

The inorganic salts which I mentioned as examples in this comparison, are those of oxide of bismuth, of deut-oxide of mercury, and of oxide of antimony. Water causes them to undergo the decomposition in question, even at the ordinary temperature: but ether is separated from a mixture of sulphuric acid and alcohol, or sulpho-vinic acid, only at a high temperature.

Among the weaker inorganic bases, there are, however, many which are separated from their combinations with acids by water, only at an elevated temperature, and the decomposition of the salts of these bases by water is therefore better suited to a comparison with the formation of ether.

To these bases belongs more particularly the oxide of iron which water precipitates at a high temperature in the state of a basic salt from the solutions of most of its neutral salts. The more the solution of the salt of oxide of iron is diluted, the lower should be the temperature required for its precipitation, the more complete is the separation, so that at a certain degree of dilution there remains no more oxide of iron in the liquor, as M. Scheerer has demonstrated; but the whole mass is separated in the state of basic salt. As water does not precipitate it from the more energetic bases, even at a boiling heat, this property of oxide of iron has been turned to account in separating it from the oxides of cobalt, nickel, and other metals. It may also, by boiling the liquor, be separated from alumine, which has, it is true, much resemblance to this oxide with respect to its properties, but which evidently is a more energetic base; this separation of alumine and oxide of iron by water, at a high temperature, has a certain importance in a manufacturing point of view, because, in the manufacture of alum, boiling is sufficient to precipitate the oxide of iron contained in the liquor, and its preparation with alumine is thus rendered more easy than that of the protoxide, which is, for this reason, much more prejudicial: oxide of iron forms, however, with sulphuric acid and the alkali, an alum completely analogous to that formed with alumine, and which, on account of its isomorphism with the latter, might be crystallized with it in all proportions.

Many other bases act like oxide of iron; they all belong, like it, to weak bases; it is the same with several substances which perform the office of bases with strong acids, and are, for this reason, frequently reckoned in the number of the acids. Such are zirconium, thorinum, oxide of cerium, deut-oxide of tin, titanic, tantalic, and tellurous acids, and, in a certain point of view, molybdic, wolframic, and vanadic acids. Many combinations of these oxides with acids may be dissolved in cold water, and are precipitated by boiling, in the state of oxides or of basic salts.

Many of the oxides precipitated in this manner possess properties which they did not present before their solution in, and their separation from, the acids. They are less attackable than before: some become less soluble, and others quite insoluble in acids, and do not combine with them immediately after precipitation, even when the latter are concentrated. In this manner may be ranked titanic acid, deut-oxide of tin, and many others. This is, in some measure, analogous to ether, which, when once it is separated by boiling from a mixture containing sulpho-vinic acid, appears not to combine immediately with acids, to form salts.

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* *Annalen der Physik und Chemie*, vol. xlviii, p. 573.

ON CHLORO-NAPHTHALIC ACID AND ON CERTAIN COMPOUNDS OBTAINED BY TREATING CHLORIDES OF NAPHTHALINE BY NITRIC ACID.*

BY M. LAURENT.

At a sitting of the Royal Academy of Sciences of Paris, held on the 22nd of June, 1840, M. Laurent read extracts from two memoirs on the above compounds: in the first he makes known:—

1. Chloro-naphthalic acid, which is yellow, crystallized, and volatile, without being decomposed. The salts which it forms are of great beauty, and may be obtained in the crystalline form; they exhibit brilliant colors, which vary in all shades, from golden yellow to carmine, passing by the orange and red tints.

The very remarkable composition of this acid is represented by $C^{40} H^8 Cl^2 O^3 + O^2$. It is contrary to the theory of substitutions, for the naphthaline has lost four equivalents of hydrogen, which have been replaced by six equivalents of chlorine and oxygen.

2. Oxy-chloro-naphthalose, which is crystallizable, volatile, without decomposition, and unalterable by the alkalies. Nitric acid converts it into naphthalic acid. Its formula is $C^{40} H^8 Cl^4 O^2$: it represents naphthaline which has changed four equivalents of hydrogen for four of chlorine and hydrogen.

3. Oxy-chloro-naphthalenose, which is crystallized in needles, and is unalterable by distillation, the alkalies and nitric acid. Its formula is $C^{18} H^6 Cl^6 O$. It represents a naphthalic radical, which has lost 22 atoms of carbon without substitution. These three compounds are obtained with nitric acid and hydrochlorate of chloro-naphthaline.

In the second memoir we find;—

1. Bromide of benzine, the composition of which is $C^{24} H^{12} + Br^{12}$.

2. Bromo-benzinise, whose formula is $C^{24} H^6 Br^6$. The first is obtained by bromine and benzine; the second by treating bromide of benzine by potassa.

3. Broméine crystallized in square laminæ, and undecomposable by distillation and by the alkalies: its formula is $C^{20} H^6 Br.^4$ It is derived from a carburetted hydrogen $C^{20} H^{10}$, which ought to be found in the crude benzine with which this substance was made.

COMBINATIONS OF CYANOGEN WITH CHLORINE.

M. Persoz communicated to the *Société Philomatique de Paris*, at its sitting of the 8th of April, 1840, certain results which he obtained in examining the combinations of cyanogen with chlorine. He made known the process by which he prepared protochloride of cyanogen, and the curious phenomena presented by this compound. Left to itself, protochloride of cyanogen undergoes a modification analogous to that which cyanous acid experiences: it is converted into a solid product (the perchloride), into a liquid and into a pulverulent matter.

NEW COMPOUND OF ANHYDROUS SULPHURIC ACID WITH OXIDE OF AZOTE.

BY H. ROSE.

M. Rose read to the Royal Academy of Sciences of Berlin, at its sitting of the 22d of July, 1839, a memoir of the above title.

If dry gaseous oxide of azote be driven into anhydrous sulphuric acid, a hard, white body is obtained, which does not fume, which quickly attracts moisture from the air, and which is gradually resolved into a colorless fuming liquid. When thrown into water, it is immediately dissolved, evolving an abundance of red vapours: the solution contains sulphuric and nitric acids. If it be thrown into water in an exhausted receiver, it immediately developes a colorless gas which forms reddish vapours, from the time that atmospheric air is introduced. Concentrated sulphuric acid dissolves a great quantity of this compound of sulphuric acid and oxide of azote; the latter cannot be driven off from this solution without the aid of heat. If water be added to this solution, it is immediately disengaged by the contact of the air, in abundant red vapours. If a small quantity of this compound be thrown into a solution of green vitriol, the latter is colored of a deep black. In other saline solutions, on the contrary, no change whatever is remarked. Alcohol converts this body into nitric ether: with ammonia it produces sulphate of ammonia at a high temperature, and with the contact of the air it is quite volatile. In this compound, the acid, as in the neutral sulphates, contains three times as much oxygen as oxide of azote.

EXAMINATION OF AN INTESTINAL CALCULUS FROM A HORSE.†

BY M. J. GIRARDIN.

In the year 1839, a miller, residing at Varengeville, lost successively five horses without any apparent cause. There were found in the intestines of these animals voluminous calculi, in great number; to their presence, doubtless, the death of the horses must be referred.

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* *Compte Rendu de l'Académie des Sciences*, No. 251. For another paper on compounds of naphthaline, by the same author, see *The Chemist*, No. VII, p. 201.

† *Journal de Pharmacie*, June, 1840.

M. Arsene Maille, a very distinguished naturalist, having collected many of the calculi, hastened to send me one, requesting me to analyse it. This calculus had been expelled by the horse, in the natural way, a little before death. At the same time M. Maille informed me that the miller was in the habit, like the rest of his fraternity, of feeding his horses with bran, at least, to a great extent, and he asked me if this regimen had not some influence on the production of the calculi found in such great number in the bodies of these animals.

I immediately recollected an interesting note published in 1831 by M. Lassaigne in the *Journal de Chimie Médicale*, in which that chemist gives it as his opinion that the use of bran and pollard, given to the mules of Alsace, was the predisposing cause of the intestinal concretions which occasioned the death of those animals. M. Lassaigne founded his opinion:—first, on the chemical nature of these concretions, which were formed almost entirely of ammoniacal phosphate of magnesia; secondly, on the experiments of M. Theodore de Saussure, which show that the phosphates are much more abundant in the seeds of *cereal* plants than in the straw and hay. Indeed, from the comparative analysis of the straw and seeds of wheat, made by M. Saussure, it is evident that whilst the former contains only 11 per cent. of alkaline and earthy phosphate, the latter contain 76·5 per cent. of them.*

It was necessary to corroborate M. Lassaigne's opinion by new facts; and as the observation made by M. Arsene Maille left no doubt as to the nature of the regimen to which the horses had been submitted, I proceeded at once to the analysis of the calculus which he had sent me.

This calculus was triangular, with smooth and rounded edges, and its irregular form, as well as its worn faces and edges, showed that it had not been alone in the intestines of the horse. Its size was that of a large apple. It was broken in two, and in its centre was presented a nucleus bigger than a filbert, of the same appearance and color as the rest of the calculus. This nucleus presented in its interior a small flattened white and crystalline fragment of carbonate of lime. When it was sent to me, it weighed 311 grammes. It must have weighed more at one time, for it was notched in several places. Externally, it was of a light color: its surface was very smooth. Internally, it had a crystalline texture, and was of a brownish yellow color. No concentric layers could be perceived in it. The crystalline lamellæ were all disposed in radii diverging from the centre to the circumference. It was very soft, and might be cut with a knife. Its powder was of a light bay color. Its density was 1·741.

Reduced to a fine powder and exposed to a heat of 100° C., it exhaled abundant ammoniacal vapours: even at the temperature of + 40°, it yielded water and ammonia, and was completely discolored. This disengagement of ammonia was because the ammoniacal phosphate of magnesia which the calculus contained was decomposed and lost great part of its volatile base at the lowest temperatures, as I have ascertained by acting directly on pure salt purposely prepared. This interesting fact had not yet been pointed out. It is common to all the other ammoniacal salts: we ought also to pay attention to this when it is required to determine their proportion of water of interposition and crystallization.

Submitted to analysis, this calculus presented the following composition:—

Water of interposition . . .	14·00
Ammoniacal phosphate of magnesia.	48·00
Phosphate of lime	19·00
Coagulated animal matter insoluble in acids and in water . . .	0·80
Matters soluble in water, consisting of aluminate of soda, sea salt, alkaline carbonates, salts of lime and magnesia	6·60
Extractive matters soluble in alcohol, with sea salt, salts of magnesia, and fatty matter . . .	4·00
Fatty matter soluble in ether . .	7·00
Loss . .	0·60
	100·00

The chemical composition of this calculus shows the cause of its formation; this certainly consists in the nature of the food given to the horses. The practical consequence of this observation is, that the feeding of animals exclusively on bran and pollard must be avoided, in general with the different substances which contain a great quantity of earthy phosphates.

QUINIC ACID.—QUINOYL.†

BY A. WOSKRESSENSKY.

A memoir on a new substance called *quinoyl*, extracted from quinice acid, was read by M. Woskressensky to the Academy of Sciences of St. Petersburg, at its sitting of the 16th of August, 1839. In a paper, some time since published in the *Annalen*

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* *Investigations concerning vegetation.*

† *L'Institut*, No. 337, June 11, 1840.

der Pharmacie, vol. 27, the author made known the composition and chemical properties of this substance. He now spoke of the modifications which it undergoes by the action of dry chlorine gas, in a glass tube.

Chloride of quinoyl is solid at the ordinary temperature, friable, soft to the touch, and of a peculiar, penetrating, aromatic odour. It decomposed organic substances, communicating to them a deep red color. It is but little soluble in water, and very soluble in ether and hot alcohol, from which it is precipitated by cold water. Notwithstanding the considerable quantity of chlorine contained in this product, it loses in it its characteristic properties, and becomes *latent;* its presence is detected only by means of the total decomposition of the substance brought to its inorganic elements. The composition of chloride of quinoyl is represented by the formula $C^{12} H^{2} O^{4}.Cl^{16}$. The author of the memoir sees in these facts a new argument in favour of the theory of substitutions. Indeed, says he, by exposing quinoyl to the action of chlorine, we have obtained a new product in which the constituent parts of quinoyl remain the same, except that six atoms of hydrogen have been replaced by an equivalent quantity of chlorine. There is reason to suppose, he adds, that this substitution is gradually effected, and that at the commencement there is formed a body in which four atoms of hydrogen are substituted by as many atoms of chlorine. By continuing the action of the chlorine, with heat, the decomposition goes farther: two atoms more hydrogen are eliminated, and thus the substance of which he speaks is formed.

RESIN OF ELEMI.

At a sitting of the Imperial Academy of Sciences of St. Petersburg, M. Hess read a paper on the composition of resin of elemi, the object of which was to maintain the formula of $C^{40} H^{66} O$, as being that which ought to represent the composition of this resin, contrary to the opinion of M. H. Rose, who, according to his analyses, represented it first by $C^{20} H^{30} O$, but afterwards by $C^{4} H^{68} O$. M. Hess is supported not only by his analyses just mentioned, but also by the recent ones of M. Marchand, which lead to exactly the same formula.

MANNER OF REDUCING POISONOUS METALS.*

BY M. GAEBEL.

This consists in mixing the substance to be examined with formiate of soda, and in heating it gently in a tube, by means of a spirit-lamp. M. Gaebel says he has thus detected $\frac{1}{1000}$ of sulphuret of arsenic in kermes, in yellow sulphur, and in sulphuret of antimony.

It is much to be regretted that the author has not given more details in support of his investigations.

METHOD OF SEPARATING PALLADIUM FROM COPPER.†

The mixture is dissolved in nitric acid, and a great quantity of water is added to the solution; it is boiled with formiate of potassa until carbonic acid is disengaged. The palladium is then reduced, and the copper remains in solution. If it contains silver, the latter is also reduced.

MODE OF SEPARATING OXIDE OF IRON FROM PHOSPHORIC ACID.

BY M. ERDMANN.

This chemist recommends that the phosphate of iron be precipitated by ammonia, and that the precipitate be calcined with carbonate of soda, which combines with the phosphoric acid. If the precipitate still contain phosphate of alumine, it is to be dissolved in alkaline water; but the phosphate of alumine may also be precipitated in the state of a basic salt, by saturating the solution of soda by a slight excess of nitric acid, and by adding ammonia. The liquid is afterwards acidulated by acetic acid, and precipitated by acetates of lead.

SEPARATION OF COBALT FROM MANGANESE.

M. Doebereiner proposes, as a means of separating cobalt from manganese, to dissolve the chlorides of these two metals in a little water, and to add to the solution fifteen or twenty times its volume of ether. The chloride of manganese is precipitated, whilst the chloride of cobalt remains dissolved, presenting a blue tint. The chloride of manganese is redissolved in anhydrous alcohol; it is again precipitated by ether; this operation is repeated a third time, in order to obtain the cobalt pure.

SPONTANEOUS COMBUSTION.†

Mr. Marsh, chemist, connected with the

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* *Journal für prakt. Chemie.*

† *Inventor's Advocate.*

Royal Arsenal, recently discovered that it is an invariable rule with iron which has remained for a considerable time under water, when reduced to small grains, or to an impalpable powder, to become red-hot, and to ignite any object with which it may come in contact. This he experienced by scraping some corroded metal from a gun, which ignited the paper containing it, and burnt a hole in his pocket. The knowledge of this fact may be useful in accounting for spontaneous fires, the origin of which has never been traced.

IODIDE OF CINNAMYLE.*

We are informed by Mr. Scanlan, that the iodide of cinnamyle, claimed by M. Despan as his own discovery,* was in reality discovered by Mr. William Moore, of Dublin, and examined by that gentleman and Dr. Apjohn. We are greatly obliged to Mr. S. for giving us an opportunity of correcting the error. This notice should have been inserted in our last No., but it was accidentally omitted.—Editors.

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* See *The Chemist*, No. 6, p. 170.

II. CHEMICAL MANUFACTURES.

ON THE FORMATION OF ACETIC ACID, FROM CARBONIC OXIDE AND HYDROGEN, IN THE ACETATES OF COPPER AND IRON.*

BY MR. J. T. JULLION.

In the *Bibliotheque Universale* is the following experiment of M. Matteuci's, on the production of acetic acid from carbonic oxide and hydrogen. It was performed by injecting a current of oxide of carbon into water containing copper in suspension. To obtain the copper in so fine a state of division, the acetate was calcined until decomposition took place, and oxide of copper was left; over this a current of hydrogen gas was passed, with the aid of heat, until the whole of the oxide was reduced to the metallic state. The oxide of carbon was prepared by submitting to the action of heat, in a gun barrel, one part of powdered charcoal, previously calcined, with three parts of carbonate of lime; that, as the carbonic acid was eliminated from the carbonate of lime, one equivalent of oxygen might be absorbed by one equivalent of carbon, thereby forming two equivalents of oxide of carbon, as shewn in the following diagram:—

$$\begin{array}{lll}
\text{Carbonic acid} \left\{ \right. & \left.\begin{array}{l}1\text{ carbon }6\\ 1\text{ oxygen }8\end{array}\right\} 14 & \left\{\begin{array}{l}1\text{ equivalent of}\\ \text{oxide of carbon.}\end{array}\right. \\
\text{Charcoal} = & \left.\begin{array}{l}1\text{ oxygen }8\\ 1\text{ carbon }6\end{array}\right\} 14 & \left\{\begin{array}{l}1\text{ equivalent of}\\ \text{oxide of carbon.}\end{array}\right.
\end{array}$$

For the absorption of any portion of carbonic acid that might escape reduction by the charcoal, some lime was placed in a cool part of the barrel, and the gas passed over it. The metallic copper was now placed in a vessel containing distilled water; into this the oxide of carbon was passed, and in a short time the water assumed a greenish tinge, the colour continuing to increase in intensity in proportion to the quantity of gas absorbed. M. Matteuci therefore concluded that the color was derived from the formation of acetate of copper, which, dissolving as it was formed, imparted its hue to the water; he imagined that the decomposition of the water was effected by the carbonic oxide combining with the hydrogen to form acetic acid, and the oxygen uniting with the copper, forming the oxide which saturated the acid as soon as it was produced.

To prove that this conclusion was correct, the solution was filtered, and part of it evaporated. It gave an abundant brownish red precipitate, with ferrocyanate of potassa, with sulphuretted hydrogen a black precipitate was obtained, and an acid liquor left, which after being exposed to heat, gave a soluble salt with oxide of lead; part of the liquor evaporated gave some small green crystals; these, treated with sulphuric acid, disengaged vapours which had the properties of acetic acid.

Some of this acid liquor was treated with oxide of iron, when a greenish soluble salt was formed; a portion of these crystals, exposed to atmospheric air, were decomposed, and a reddish brown powder was the result. On substituting the oxide for metallic copper, no acid was formed; but on passing a current of cyanogen into water in which copper was suspended, the same effect was obtained as with the oxide of carbon.

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* Communicated by the Author.

Now, acetate of iron, being an article of great demand in this country by the dyers and calico-printers,—for whose use a considerable quantity is prepared and sold under the name of iron liquor,—I thought that the foregoing experiment might be turned to some practical purpose, especially as iron is more easily oxidized than copper. Should this be the case, it would furnish a much more economical mode of preparing that liquor than the one now in practice, of adding a solution of acetate of lead to a solution of sulphate of iron, whereby a double decomposition is effected, sulphate of lead precipitating in a white flocculent powder, acetate of iron remaining in solution.

Under this impression I tried the following experiments, very much to my satisfaction, and have no hesitation in recommending it to the trade generally, as a process for producing that article, fully as well adapted to their purpose, and possessing the same properties, as the solution of acetate now in use. In point of economy, it has a decided advantage, as the carbonic oxide is producible at the lowest possible expense, from a source most bountifully supplied by nature; whereas, the acetate of lead must be made in the first instance from an expensive article, the pyroligneous acid, from which it is produced, having previously to undergo the process of purification, to separate the tar which would otherwise prevent the acetate of lead from crystallizing. The simplicity too of the operation, and the total absence of any complicated machinery, are great recommendations in its favour, and will, I trust, tend to its introduction on the manufacturing scale.

I procured pulverulent iron by precipitation of the carbonate, from sulphate of iron, or green vitriol, by means of carbonate of soda, —the common crystallized soda of the shops answering as well for this purpose for the best or pulverulent carbonate. The precipitate, after being dried, was placed in a porcelain tube, in a furnace, and a current of hydrogen gas was passed over it, until the whole of the oxide was reduced to the metallic state, when it formed a black, porous, spongy mass. I must here state that this was done at a heat considerably below redness. The ends of the tube were then carefully stopped with clay, to prevent the access of air, and withdrawn from the fire, when it was allowed to grow cold; for should the ends not be stopped, and the air in consequence gain access to the iron before it is quite cold, the whole becomes incandescent, and takes fire spontaneously, burning like tinder until the entire mass is reconverted into oxide. This spongiform mass was gently triturated in a mortar, and placed with some distilled water in a vessel furnished with an agitator; to this vessel a pipe was attached, which connected it with a glass retort for the generation of the oxide of carbon, through which the gas was conducted to the vessel. I procured the carbonic oxide from oxalic acid, by decomposing it by sulphuric acid with the aid of heat; as oxalic acid is composed of one equivalent of carbonic oxide, one of carbonic acid, and one of water, the sulphuric acid combines with the water, eliminating the carbonic acid and oxide in the gaseous state. To absorb the carbonic acid, the whole was passed through lime-water, previous to being admitted into the vessel containing the iron and water. In the course of a short time, the water began to assume a greenish appearance: this increased as the process continued, until it arrived at a bright transparent green colour; by this time the oxalic acid being decomposed, and no more gas being eliminated, the pipes were unluted, and the product submitted to the following tests:—

Some of the liquor, evaporated, gave crystalline prisms of a greenish color, which were decomposed in the air, a reddish brown efflorescence forming on the surface. Some carbonate of soda being added to a portion of the solution, a brisk effervescence ensued on stirring it, and a precipitate was formed, which, when dried, was of a brown red cast. The solution of soda, on being evaporated, gave crystals of a rhomboidal form; these, decomposed by sulphuric acid, and the liquor distilled, gave an acid liquor, the vapour of which corroded a plate of lead, forming a white crust on the surface. This crust, when pounded in a mortar, and dilute nitric acid poured upon it, was dissolved with effervescence of carbonic acid, proving that substance to be carbonate of lead, and the acid the acetic. Some of the crystals when decomposed by pouring sulphuric acid slowly upon them, aided by heat, gave off pungent vapours of acetic acid. The acid liquor likewise dissolved oxide of lead, oxide of zinc, and carbonate of copper, the latter attended with effervescence; but neither of the metals were affected by it when immersed in it, although lead when dipped in it and exposed to the air, was gradually corroded. Under all the circumstances, there can be no hesitation in pronouncing the substance in question to be acetic acid.

The theory of this process I imagine to be as follows:—water is decomposed, the hydrogen uniting with the carbonic oxide to form acetic acid, while the oxygen combines with the iron, forming oxide, when one atom of oxide of iron saturates one atom of acetic acid,—thus producing acetate of iron, as shown in the diagram below:—

4 equivalents of carbonic oxide, 14 × 4	1 oxygen	8		
	1 oxygen	8		
	1 oxygen	8		
	1 oxygen	8		
	1 carbon	6		
	1 carbon	6		
	1 carbon	6	51, or 1 equivt. of acetic acid.	9, or 1 equivalent of water.
	1 carbon	6		
4 equivalents of water, 9 × 4.	1 hydrogen	1		
	1 hydrogen	1		
	1 hydrogen	1		
	1 hydrogen	1		
	1 oxygen	8		
	1 oxygen	8		
	1 oxygen	8		36, or 1 equivalent of oxide of iron.
	1 oxygen	8		
	1 iron ..	28		

the last three equivalents of oxygen, combining with three equivalents of iron, to form oxide of iron, which remains undissolved; making the product of the decomposition of water by carbonic oxide, one equivalent of acetate of iron, and three equivalents of oxide of iron.

Although in my experiment I procured the carbonic oxide from oxalic acid, still I prefer as the cheaper mode, and better adapted to a large scale, the production of it from carbonate of lime and charcoal; the oxalic acid being better adapted to the apparatus I possessed, was the cause of its substitution.

The action of cyanogen, as given by Matteuci, on water and metallic copper, I should imagine operated in a somewhat similar manner. Cyanogen being composed of two atoms of carbon, and one atom of nitrogen, two atoms of cyanogen are decomposed, their carbon uniting with three atoms of water to form acetic acid, while their nitrogen decomposes six atoms of water, the hydrogen combines with the nitrogen, forming two atoms of ammonia, while the oxygen combines with the copper forming oxide, which saturates the acetic acid, forming acetate of copper.

M. Guerin advances, that carbonic oxide, like chlorine, is capable of forming an acid, by combining with either hydrogen or oxygen; in the first case acetic is the result, in the latter the carbonic acid. Thus the matter stands at present, but as the science of chemistry advances, I doubt not means will be found of producing this as well as other acids, directly from their elementary gases, without the intervention of any saturating body.

M. DAGUERRE'S LATEST IMPROVEMENT.*

The powers of the Daguerréotype have hitherto been limited to the representation of "still life." Any attempt to pourtray objects in a state of motion, has always been a failure. If the object was moving with much rapidity, no trace was left upon the picture; if the motion was slower, a slurred and blotted appearance was presented, arising from an imperfect representation of the moving body being spread over the path travelled. M. Daguerre recently informed Sir John Robison that he had nearly completed an improved process, by which the Daguerréotype will be capable of receiving instantaneously the impression of any objects presented to it. Invested with this splendid power, the instrument will become altogether unrivalled; it will only have to be presented to the stage of a theatre, the bustling street of a city, &c., when an accurate picture of things as they are in motion at the precise moment, will be obtained. With equal facility we may thus procure faithful portraitures of the most striking dramatic representation—all the pomp and circumstance of war as developed in mimicry at reviews—the vehement debates in the senate house—the marriage of a Queen—or the rejoicing of her subjects—all which may thus be represented with a fidelity and force of which the pencil of the most skilful artist can never become susceptible.

GAMBOGE, AS A PIGMENT.†

BY MR. H. DIRCKS.

Gamboge, as imported into this country, from the East Indies, is usually in fragments, cakes, or short rolls; this latter form it derives from being cast in reeds, such as the bamboo. Though a vegetable product, it is not clearly ascertained either from what tree it is obtained, or by what mode it is procured; whether by incision, pressure, or by natural exudation. It is a gum resin, and, in its dry state, it is of a dark orange colour throughout, moderately heavy, breaking readily, with a glossy, and somewhat resinous fracture. It often appears in masses, produced by smaller pieces which have conglomerated simply by the influence of a warm atmosphere. Pieces of gamboge are found to vary considerably in clearness and purity, some having a darker, greener shade than others, and some, too, breaking with a shorter, glossy fracture, exhibiting a shining red resinous appearance.

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* *Mechanic's Magazine*, No. 880.

† From a paper read before the Polytechnic Society of Liverpool, June 11, 1840.

As a pigment, gamboge is of some durability in water colours. It is also used as medicine, being found to act as a powerful cathartic. Its chemical composition has been variously stated to be attributable to the presence of a variable quantity of its principal constituents, the gum and resin, or foreign vegetable matter. According to Braconnot, there are, in 100 parts, 20 of gum to 80 of resin, that is in the ratio of 1 to 4. Dr. Christison,* *British Annals of Medicine*, gives the following result of his analysis of three varieties :—

	Cake.		*Lump.*		*Coarse.*	
	1	2	1	2	1	2
Resin ..	74 2	71 6	64 3	65 9	61 4	35 0
Arabian	21 8	24	20 7	19 7	17 2	14 2
Moisture	4 8	4 8	4	4 2	7 2	10 6
Lignin .	trace	trace	4 4	6 2	7 8	22
Starch .	——	——	6 2	5	7 8	19 0
	100 8	100 4	99 6	100 1	101 4	100 8

Dr. Thomson alludes to its being dissolved in alkalies, and being converted, by nitric acid, into a yellowish, bitter matter; also, that chlorine deprives it of its dark colour, a combination taking place between it and muriatic acid, which latter it neutralises.

In its dry, solid state, though of a very dark colour, it soon shows a pale, yellow tint when dipped in water, in which, when ground very fine, it affords a turbid, lemon yellow emulsion. In this aqueous preparation it is long before any portion of the gamboge subsides; indeed, no absolute colouring matter is deposited, even when only a few grains are diffused through a quart of water. When the emulsion is of a creamy consistence, if a drop of this be allowed to fall on the surface of water in a tall, cylindrical glass vessel, it will, owing to its viscid nature, occasion a beautiful appearance in its descent, not unlike an inverted flower stem.

Gamboge readily dissolves in spirit of wine, affording a bright, deep orange red tincture, which gives to paper a yellow stain. Applied dry to hot marble, gamboge has been found to impart to it a clear, yellow colour.

A substance is known to artists, by the name of "extract of gamboge;" this is nothing more than gamboge precipitated from its spirituous solution, by adding a little water. If too much water is added to the saturated spirituous solution, the action of the spirit of wine is overpowered, and the common aqueous emulsion is formed. When carefully managed, an opaque yellow precipitate results, which must be allowed to settle; it will then be requisite to draw off the supernatant liquor, and, with a spatula, to remove the layer of greenish gum above the gamboge, from which, when freed, there is obtained a powder, much lighter in colour than the original gamboge, capable of being prepared in oil as a glazing colour. This method is that usually recommended and adopted.

Another process, and one which I have found to be expeditious and certain, is conducted as follows :—

Prepare a mixture of gamboge in water; add strong liquid ammonia, or caustic soda in solution; do this gradually, shaking the mixture each time until the whole changes from a turbid yellow to a beautiful rose-red colour. If an acid be now added, precipitation takes place; pour in muriatic acid at intervals, until the red colour disappears, and is replaced by a curdy, yellow precipitate; now wash in plenty of water, collecting the precipitate on a filter of blotting paper.

Heated on glass, over a spirit lamp, gamboge melts, swells, and carbonises. If heated without burning it does not lose its property of dissolving, in either spirits of wine or alkalies. A piece of glass made hot, then rubbed over with a stick of gamboge, acquires a thin, transparent coating of a golden yellow colour. It dissolves by heat in spirits of turpentine very partially: the tincture gives a peculiarly equable yellow stain to paper. Boiling in plain water has no effect on gamboge; the addition of alum, with a little sulphuric acid to the hot liquor, occasions a partial precipitate in a few days.

Gamboge certainly does not contain any colouring matter which can be procured apart from gum or resin. The precipitate, however obtained, is no more than a deeply-coloured resin, and as such, its value as an oil-colour is exceedingly doubtful. Field, in his Chromatography, speaking of this interesting substance, observes,—"Sir Joshua Reynolds and Wilson are said to have employed it, and so, also we know, did the amiable President, West; the first of these used it softened into a paste with water, and the latter in a dry state, precipitated upon whitening. It has also been employed as a yellow lake, prepared upon an aluminous base; but a much better way than either is,

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† See Thomson's Organic Chemistry.

to dissolve it into a paste in water, mix it with lemon-yellow, with which pigment being diffused it goes readily into oil or varnish." And again, treating of his lemon yellow, prepared from platina (but latterly from barium), he says, "In water it exceeds gamboge in brightness, and in mixture therewith improves its beauty. The mixture, also, goes readily into oil; indeed, it is the best and easiest way of rendering gamboge diffusible as an oil-colour—simple solution of the gamboge in little water, and trituration of the lemon-yellow therewith, being all that is requisite for this purpose." In his remarks on white lead he states it to have an injurious effect on gamboge.

We have thus briefly detailed the nature and properties of this curious gum-resin, as far as it is at present known. With the artist it is an object to render it miscible in oil, which, without preparation, is not easily effected. Some doubt its permanence, attributing to it a liability to darken, like the original substance, to an orange tint; but we have seen it unaffected in the admirable works of Wilson. It is a substance of no very extensive use in the arts beyond being sometimes used in lacquering, and by the gilders, in colouring their size.

KALSOMINE.*

A new and inodorous sort of paint, the invention of Miss Fanny Corbaux, has been lately introduced to public notice. The materials of which it is composed are at first soluble in water; and while in this state admit of the design being effaced, or a portion of the colouring of a wall or ceiling being removed, if necessary; a subsequent operation renders the paint insoluble, by a chemical change of the properties of the material, which fixes the colour durably. It is free from any offensive smell, dries in a few hours, is not acted upon injuriously by atmospheric influences, and is said to be more durable than oil paint, as well as more agreeable to the eye, and not at all prejudicial to the health; indeed a room painted with it one day, may be inhabited the next. It may also be made applicable to easel painting also. We have seen a little landscape painted with this material, which combined something of the depth and solidity of oil with the transparency of water-colour; and a specimen of broad flower painting, for a room, was shown, which possessed remarkable purity of tone, and a brilliancy of effect superior to any ornamental painting we have seen, and which resisted the rude action of the scrubbing-brush. The effect of the white as a ground for gilding is extremely clear, without being dazzling; and we can well understand that it possesses the property ascribed to it of "softening and diffusing light."

FRENCH COINAGE.†

The *Moniteur* states that the preliminary experiments for the new coinage in copper continue to be made under the direction of Baron Thénard. The Minister having prescribed that an essay should be made of casting bars of perfectly regular dimensions, and free from all oxidation, composed of 90 to 96 parts copper, and 10 to 4 parts pewter, an experiment for that purpose has been made with cast iron moulds, and has been perfectly successful. By this method the new money will be free from all oxide, and the operation will be conducted with greater economy, on account of the cast-iron moulds being able to be worked, as they are in the Mint of London, by machinery.

EXTRACTION OF INDIGO FROM THE POLYGONUM.‡

BY M. OSMIN HERVY.

The solution of the question proposed by the *Société de Pharmacie*, was pointed out as being required to be both theoretical and practical: the competitors, in giving a better process for extracting indigo from the polygonum than any hitherto known, were to indicate its state in the leaves of that plant, and the real quantities which they contain.

M. Osmin Hervy has entered on the subject with method and precision: the fresh and entire leaves were successively treated several times, by ether, by alcohol, and by boiling water: the products soluble in these different menstrua were thus obtained, and examined separately with the least possible perturbation, in their constitution. The leaves, reduced to a colourless skeleton, preserving their form and texture, were treated by alkaline solutions, then washed and incinerated. From these experiments M. H. draws the following conclusions:—

1st. That indigotine exists quite formed in the leaf of the polygonum, not free, but combined with the red resin:

2nd. That this normal combination is destroyed by the mineral bases and acids whilst organic acids do not act on it:

3rd. That at the shooting forth of the

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* From *The Athenæum*, No. 660.

† *Mechanics' Magazine*, No. 883.

‡ *Journal des Connaissances Médicales*, June 1840.

leaf, the indigotine is white, but that it becomes blue under the influence of air and light:

4th. That the green leaves contain colourless and blue indigotine, and the more of the latter as they advance in age:

5th. That ether dissolves the normal combination without modifying its composition; whence it results that the ethereal tinctures of the green leaves always precipitate it, even when sheltered from the contact of the air, but the quantity of colouring matter is proportioned to the age of the leaf:

6th. That these tinctures contain also colourless indigotine, since, by contact of the air, they all precipitate of a blue colour with the same intensity:

7th. That when water is substituted for ether, for dissolving the normal combination under the influence of organic matters, indigotine is procured in the white state, without the normal combination being destroyed: the aqueous solutions do not give blue precipitates in contact with the air:

8th. That oxygen acts only in coloring, and consequently in the precipitation of blue indigotine, the solutions in contact with nitrogen, or carbonic acid gas:

9th. That indigo is entirely in the blue state in the dried leaf, not free, but combined with ligneous fibre:

10th. That in the pulp of the fresh leaves indigo is entirely in the blue state; that there also, as in the dried leaves, the indigotine is colored:

11th. That indigo does not exist in the polygonum in the same state as in other plants which contain indigo, since the latter, when dried, readily yield their indigo to water.

Most of M. Hervy's considerations are justified, as we have said, by numerous and authentic experiments: only the commission of prizes considered that the nature of the combination of the red resin and the coloring matter was not sufficiently established; it was of opinion that it might be a peculiar substance, which was divided into two new bodies, under the influence of certain menstrua.

Proceeding to the extraction of indigo, M. Hervy proves that the processes hitherto proposed are defective: those of MM. Berard and Baudrimont, because they give an indigo of excessive hardness and mixed with pectine; that of M. Vilmorin, because it is too expensive: he shows that the use of boiling water diminishes the quantity of coloring matter existing, by fixing a portion of it on the tissue of the leaves.

His process of extraction consists in macerating the leaves, for two hours, in water at 60° C.; the liquid, which is colored of a fine blue by the contact of the air, is decanted, and four grammes of hydrate of lime are added to every pound of leaves employed; it is stirred and allowed to settle, and the precipitate is washed with water acidulated with hydro-chloric acid, in order to dissolve the excess of lime, and is then dried. The short time that the leaves remain in maceration in the water does not allow of much pectine being dissolved, and the indigo obtained is more easily dried, and remains more pliable than that extracted from the polygonum by M. Baudrimont's process, or by that of the colonies.

The production of indigo varies greatly according to the soil, and especially the period of vegetation. The time at which the polygonum contains the most is a little before flowering. The first-gathered leaves also contain more than the second. Under the most favourable circumstances, M. Hervy thinks that the leaves of the polygonum may yield $\frac{1}{250}$ or $\frac{1}{300}$ of their weight, of a fine commercial indigo.

This memoir, which was followed by an excellent note by M. Vilmorin, jun., on the culture of the polygonum, obtained a prize of 1000 francs.

MODE OF EXTRACTING INDIGO FROM THE POLYGONUM.*

BY MM. GIRARDIN AND PREISSER.

The following is the process recommended by these chemists, for extracting indigo from the polygonum:—

To put the leaves in a long and narrow tub with a tap at the botton; to pour in water at 30° C., in the proportion of about three times the weight of the leaves; to cover the latter with a wicker hurdle, in order that they may remain completely immersed in the liquid, and to leave the operation to itself until the water has acquired a greenish tint, and its surface presents beautiful rainbow-colored froths *(écumes irisées)*. The liquid is to be very quickly drawn off, gradually compressing the leaves; a hundredth to a hundredth and a half of hydro-chloric is immediately to be poured in, and the liquid is to be passed through a sieve, in order to isolate the green and albuminous matters which float in greenish flakes, in the midst of the acidulated liquid; the filtered liquor is to be stirred for about ten or fifteen minutes, several times, in order to oxygenise the dissolved indigo, and afterwards left to settle for twenty-four hours. The indigo found at the bottom of the vessel must be put on a filter, washed with slightly alkalised boiling water, and afterwards dried at a temperature of from 40 to 50° C. It will be of a beautiful shade, excessively light, and fit for immediate sale.

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* *Journal des Connaissances Médicales*, June 1840.

M. SELLIGUE'S LIGHTING GAS.*

On the occasion of the report concerning M. Selligue's lighting gas (for which see *The Chemist*, No. VII. p. 207), M. Pelletan reminded the Academy of Sciences that he had long since announced that lighting gas owes its illuminating properties to oily vapors accompanying the hydrogen gas. In a Memoir read to the Academy, on the 9th of December, 1816, he thus expresses himself:—

"Expecting that my work may be made public, I am in a situation to announce, that the gas procured from wood, coal, or from any animal or vegetable matter whatever, owes its properties of burning with a white flame exclusively to the presence of a certain quantity of oil, dissolved in the hydrogen; that carbon, in whatever manner and in whatever proportion it is combined with the hydrogen, gives only a red and not very luminous flame; and finally, that the flame of hydrogen gas is much more luminous when it dissolves, and retains a greater quantity of any oil."

In another part of that Memoir, M. Pelletan explains in detail the facts of the decomposition of water on red-hot coals, and of the solution of oil in the gases formed, as well as the method of extracting the oil to be afterwards used for making gas luminous; thus furnishing, not only the principles, but also the processes which have since been successfully employed by M. Selligue.

ENGRAVING FROM PHOTOGRAPHIC IMAGES.†

BY M. DONNE.

"After having ascertained," says M. D., "1st, that the yellow layer, produced on the face of the silver by the vapour of iodine, was really formed of iodide of silver; 2nd, that light, or rather the chemical rays accompanying it, acted on this layer by modifying its adherence with the silver, in such sort that this adherence is found more or less diminished, according as the action of the light on the different parts of the layer of iodide is stronger or weaker; 3rd, that the mercurial vapor, to which the plate, after it is taken from the camera obscura, is exposed, touching the silver in all the points not guarded by the layer of iodine, was amalgamated with it, and thus caused the appearance of the image; 4th, that this action once produced, the layer of iodine having served as a momentary covering, which should be penetrated only in the parts acted on by the light, was dissolved and removed by a solution of hyposulphite of soda, and by washing in water; 5th, that the photographic image resulted from a more or less condensed amalgam of mercury and silver, forming light parts and demi-tints, and bare surfaces producing shades, like pieces of ice which reflect black;—I thought it might be possible to find some chemical agent able to attack the bare parts of the silver, sparing the light parts formed by the amalgam of that metal with mercury."

The first care to be taken is in the selection of plates. In the first place, it is necessary that the silver leaf, with which the copper is covered, should not be too thin. The plates should be as beautiful and as pure as possible, without cracks or bubbles, very well polished, and of a perfectly homogeneous grain. Having obtained a plate possessed of all these qualities, the image should be executed by the ordinary daguerréotype process, and as perfectly as possible, the engraving minutely copying all the details of the picture with their good qualities and defects. It is washed with a solution of hyposulphite of soda, very dilute, in order to remove nothing more than the layer of iodide of silver. The plate being well dried, its edges must be covered with a layer of engraver's varnish, so as to avoid the contact of the mordant with the copper, and the drawing is to be put in a frame. It is laid on a basin, on the edges of which it rests by its four corners. On its surface is poured, so as to cover with a very thin layer all the parts not protected by the varnish, nitric acid, diluted in the proportions of three parts of acid to four of water: this must be strictly adhered to. This mordant is the only one with which M. Donné was enabled to succeed. In three or four minutes, the action commences, first, by the appearance of small bubbles of gas, which soon extend all over the plate in contact with the liquid. It is difficult to say how long the action of the acid should be continued, but as it is very rapid it should not be kept up more than two or three minutes. When the plate is sufficiently acted on, the acid liquid is allowed to run into the basin; it is washed with a great quantity of water, and very gently wiped with very fine cotton; the operation is then terminated. It is then necessary to confide the plate to a careful and skilful copperplate engraver, to take impressions of it by the ordinary process, being as careful as possible with the metal, which is always very delicate, and the engraving of which is not very deep, as may readily be conceived.

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* *Compte Rendue de l'Academie des Sciences*, No. 24.

† *L'Institut*. No. 339, June 25, 1840.

M. Donné could succeed in obtaining only forty engravings with photogenic plates, thus engraved. He is of opinion that this might be applied to copying daguerréotype images on lithographic stone, but he has not yet succeeded in doing so.

APPLICATION OF PHOTOGRAPHY TO METEOROLOGY.*

BY H. HUBERT.

It is sufficient to collect on a disc, or on a turning cylinder, covered with a sheet of metal or paper prepared for receiving the impression of light, the projection of the inferior extremity of a hygrometer, &c. For that purpose is placed in a sheath with two linear parallel slits, diametrically opposite, the stem of a thermometer or of a barometer, or the weight of a hygrometer (the latter, in this case, should be stretched out and lightly suspended): the sheath is afterwards disposed before a cylindrical envelope, pierced also in the direction of its edge with a linear slit, which may at will be opened or shut by a languet (care must be taken that the three slits correspond): under the envelope is placed the turning cylinder we have spoken of, the diameter of which should be nearly the same as that of the envelope: light throws on this cylinder, through the three slits, the extremity of the column of mercury of the barometer, or of the thermometer, or the lower extremity of the weight of the hygrometer. This cylinder, in turning round on its axis, presents, successively, each of its sides to the impression of light, which traces on its surface a line whose ordinates, reckoned according to each side, represent the indications of the instrument used in the experiment, and the abscissæ measured on the circumference of the base, give the hour of these indications. In each experiment the collecting cylinder, which is moved by a clock, should not make more than one entire revolution round its axis.

There may likewise be found, for each of these meteorological instruments, means of employing photography for registering their indications.

APPARATUS FOR ESTIMATING THE QUANTITY OF GAS DISENGAGED DURING A CHEMICAL OPERATION.†

M. Persoz exhibited to the *Société Philomatique de Paris,* at its sitting of the 8th of April, 1840, the drawing of an apparatus, which might be used for estimating the quantity of gas disengaged during a chemical operation, when the gas forms a very considerable volume, as, for example, from 4 quarts to 4½. The new apparatus is composed of a little bell, intended for estimating the gas before the experiment, and of a cylinder communicating with this bell, and terminated by another very narrow tube, which is used for measuring the gas when the experiment is concluded. The inventor explained the inconveniences which the former apparatus presented, and which he wished to remedy.

M. Despretz claimed for himself, the first idea of this apparatus: he declared that, in the experiments which he made in order to analyze the air at the time of the cholera, he employed likewise a cylinder terminating in a very fine glass tube.

M. Persoz replied, that the first apparatus of this kind which he had constructed, was before that time, and that it still existed in the *Collége de France.*

ON THE INCONVENIENCES OF CHLORINE IN BLEACHING PAPER.‡

BY M. COULIER.

This reagent possesses an element of destruction which it is important to take notice of. M. Coulier announces that he has proved, by numerous experiments, that paper, whose paste has been bleached by chlorine, however well washed it may have been, possesses elements of destruction, which, after a few years, must render it brittle, and may, in less than a century, reduce it to powder.

M. Gannal remarked the same inconveniences of bleaching by chlorine years ago.

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* *L'Institut,* No. 336.

† *L'Institut,* No. 331.

‡ *L'Institut,* No. 327.

III. PHARMACY, &c.

ON THE SALE OF POISONS.

To the Editors of The Chemist.

Gentlemen,—The hints given by your correspondent "J. T.," in the last number of *The Chemist*, on the Sale of Poisons, are worthy of serious consideration, inasmuch as the subject is one of paramount importance, affecting as it does both public and private interests. The sale of poisons by persons ignorant of their danger, properties, and use, ought to be suppressed, and none should be allowed to sell them but such as are competently acquainted with them. The practice of requiring the presence of a witness ought to be strictly followed; but it is lamentably and criminally neglected to a very great degree: hence the many deaths arising from mistake as well as suicide.

During an experience of nearly 12 years in the drug trade, I have often met with individuals who, wanting small quantities of poisons, such as arsenic, sublimates, cantharides, and various others equally dangerous, without being accompanied by a competent witness; and on my refusal to serve them with such dangerous drugs,—it being my constant practice never to allow any of such articles to go out of my shop except through my own hands, and, with but very few exceptions, their being accompanied by a witness, on the ground of their dangerous nature,—I have received for a reply, "I can get them elsewhere without so much trouble," and they have done so, in some cases from equally respectable establishments, but more frequently from persons totally unfit to be entrusted with the sale of such dangerous drugs, without any inquiry as to the intended use, often without a proper degree of discrimination.

How often have families been plunged into the deepest distress from suicide, through poisons being sold with a criminal want of caution? A case very recently occurred where an old woman sold T. Opii for T. Rhæi, and consequently the person who took it lost his life; and more recently, in a large midland county town, a melancholy instance occurred to a young female, who purchased arsenic of an individual who, on examination before the coroner, was found totally ignorant of its dangerous properties and of his own moral responsibility. The daily occurrence of such instances, causing a large amount of human life to be sacrificed, through ignorance and cupidity, demands that some preventive measures should be speedily brought into use..

Hoping that some of your numerous and intelligent correspondents will bring the matter to some bearing, and draw the attention of the trade generally to it, and pleading the vast importance of the subject as an apology for so lengthy a communication, I remain,

Yours respectfully,

A Provincial Chemist and Druggist.

July, 1840.

[We wish that the practice of "A Provincial Chemist and Druggist" were more generally adopted and adhered to. In our opinion, it would tend greatly to diminish the sad sacrifice of human life so often occurring through the ignorance or negligence of the vender.

In addition to the above letter, we have received one from a correspondent signing himself "A Subscriber," ridiculing the suggestions of "J. T." given in our last number. "A Subscriber" says, "it would be utterly impossible to *do away* with the sale of poisons to the extent desired by J. T." He says also, "it would be as well to introduce into the Medical Reform Bill a clause prohibiting cutlers from selling razors, lest the purchaser should meditate cutting his throat, — as one preventing chemists from selling poisons." This is nonsense. "J. T." never contemplated the *prevention* of the sale of poisonous articles; he merely suggested that no party should be supplied with them unless accompanied by a person to witness the transaction. Moreover, there is a great difference between the sale of razors and that of poisons. A razor is an instrument whose use and nature every one is acquainted with: when a man buys a razor, it is assumed, as a matter of course, that he intends to shave himself with it;—when, on the contrary, he purchases a poisonous article, some doubt must naturally arise in the mind of the vender as to its intended use; indeed, it might very reasonably be suspected that the purchaser had some improper motive in view, such as suicide or murder.

Our correspondent is also mistaken in supposing that "J. T." would have these restrictions confined to druggists; his suggestions extend to all who sell poisonous articles.

The subject is one of the utmost importance; it is also, we admit, one of great difficulty. The present loose mode of selling deadly poisons is truly frightful.]

MEDICAL REFORM AS RELATES TO DRUGGISTS.—PRACTICE OF "TICKETING" RESORTED TO BY SURGEONS.—PER CENTAGE SYSTEM.

In all legislative measures for improving the ill-regulated state of the different departments of medical practice, great care has been taken to give every advantage to the surgeon and the apothecary, and particularly to secure him against any injury from the chemist and druggist. This, doubtless, is quite proper; but, at the same time, even-handed justice is due alike to both, and we do hope that in the new Medical Reform measure, which, it must be confessed, is a very long time in legislative gestation, the interest of the druggist will also be equally protected against any encroachments of the profession or their rights.

If this bill is totally to exclude chemists and druggists from prescribing medicine, or in any way interfering in medical or surgical practice, it is the duty of the Legislature to prevent surgeons and apothecaries from retailing medicines and drugs, except those which they individually prescribe, and from dispensing prescriptions, and certainly, in all cases, from keeping open chemists' shops. This will be an act of justice to the one, and will have the effect of increasing the respectability of the other.

It is quite clear that in the earlier period of medical practice the apothecary was, what the druggist now is,—that he only sold, and did not prescribe medicine.*

That it is high time proper restrictions should be put on this pernicious system, no one can for a moment attempt to doubt or deny: especially when we take into consideration that it is carried to the most unfair and degrading extent, and that the same low-minded and puffing mode of getting "custom" is adopted, as is resorted to only by the very lowest orders of shoemakers, butchers, haberdashers, &c. &c.: we allude to the disgraceful practice of "TICKETING." Several instances of this have lately come under our notice. At a shop lately opened in Goswell road, by a person styling himself "SURGEON AND ACCOUCHEUR," medicines may be seen with their prices ticketed up at one-half lower than they can be sold by others, and this (if we may credit the announcement over his door) by a "REGULAR SURGEON." There is also another ticketing shop near Smithfield, besides others too numerous to mention. We warn these parties, and others of the same stamp, that our eye is on them, their method of doing business, and the quality of their drugs; and we dismiss them for the present with, by way of admonition, a recommendation speedily to reform their practice. We will not at present mention names, (of which we are already in possession,) hoping that they will render such a proceeding unnecessary. We beg to caution our readers, and the public generally, against purchasing drugs at shops where such practice is adopted, as they will not only be sure to obtain the worst possible articles, but will also be countenancing a system, disgraceful in any trade, and subversive of its best interests.

There is as little room for the HIGHEST branches of the profession to complain of the druggists; for it is well known that some of the FIRST physicians and surgeons—even those with the highest titles that can be bestowed on medical men, some of the attendants on ROYALTY—take a regular "per centage" from the druggist on every prescription they send him.

These facts,—and that they are facts not a doubt can exist,—demand immediate correction: all complaints against quackery and imposture proceed with a very bad grace from a profession teeming, in every grade, with the most disgusting practices, flagrant abuses, and sordid cupidity.

It will indeed be a Herculean task to restore to respectability a profession so sunk in degradation, and so replete with abuses; and we hope that those to whom the framing of the new Medical Reform Bill is entrusted, will "put their hands to the plough," and that no means will be wanting, or suggestions neglected, which are in any way calculated to effect an object of such vital importance to the profession and to society.

EXEMPTION OF CHEMISTS FROM SERVING ON JURIES.

To the Editors of The Chemist.

GENTLEMEN,—It was with great pleasure that I read Mr. Gallard's very sensible letter on the necessity of chemists being exempted from serving on Juries, and from any State service. It is unquestionably of as much importance to the public safety that they should not be required to perform such duties, as it is that the other branches of the profession should be exempted from them. And this is not only the unanimous opinion of chemists themselves, but also that of the higher branches of the profession, and of the public generally. Your excellent advice, to appeal to the Legislature on the subject, ought to be immediately attended to; there cannot be a better time than the present—just prior to a Medical Reform measure being discussed by the House of Commons.

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* His name warrants this conclusion, for the word is derived from *apotheca*, (απο and τιθημι,) Anglice, an apothecary, "quod pharmaca sua tanquam in apothecis reponat."

I do most earnestly hope, therefore, that you, or some of your talented correspondents, who are far better qualified for the task than myself, will forthwith draw up a PETITION, judiciously worded, and publish the same in your valuable Journal, with a recommendation that it be adopted in EVERY TOWN in England, and as many signatures as possible obtained to each, and that they be then confided to some M.P. favourable to our cause. Such an appeal, I think with you, could not fail to prove successful; and if such should be the result, you, Gentlemen, will have the satisfaction of knowing, that through the instrumentality of your Journal this important object will have been attained.—I am, Gentlemen, with the greatest respect,

Your obedient humble servant,
ANTHONY MAYHEW,
Chemist and Druggist.

Waltham Abbey, July 7, 1840.

[We concur with Mr. Mayhew as to the measures to be adopted for securing so important a desideratum as the exemption of druggists from serving on juries, and we will cheerfully lend our assistance to it. Our columns are at all times open to anything tending in any way to alleviate or remove the disadvantages under which this highly important branch of the medical profession at present lies.]

TREATMENT OF ULCERS, &c., BY DILUTE CHROMIC ACID.

BY CHARLES WATT.

Having for many years had extensive opportunities of observing the very powerful action of chromic acid in preventing and stopping the progress of putrefaction in inanimate matter, I was induced to try its effects on foul and fœtid ulcers,—and with very decided success.

The mode I adopted to obtain the chromic acid was as follows:—I took one ounce of the bichromate of potassa in powder, and having dissolved it in six parts of boiling water, I then added about three drachms of sulphuric acid and saturated any superabundant acid with common chalk, till the liquid gave no signs of sulphuric acid upon being tested with chloride of barium. When the liquid had stood to become clear I poured it off gently, and then added about six ounces of water, when it was fit for use.

I first of all tried it on some very foul old ulcers of the legs, which had proved very obstinate under all previous modes of treatment. After a few dressings with the dilute chromic acid they soon put on healthy appearances, secreting a thicker pus free from fœtor, and having granulations which at length filled up the cavity of the sores, which then healed.

In many cases I found it of great service as a wash for foul venereal sores; they soon became clean and healthy. In these cases the applications were made in the following manner:—a piece of lint of the size of the sore was dipped into the solution, and then placed upon the whole surface of the ulcer, and over it another piece of lint spread with spermaceti ointment. I likewise employed it in several cases of scrofula, in which, as an application I found it very beneficial. In cancer also it gave very great relief, from the distressing pain, and prevented the fœtid discharge, which is so constant an attendant on this dreadful malady.

As an injection, when very dilute, in gonorrhœa its effects were equally beneficial.

The repeated trials which I gave it in the above mentioned cases, and the uniform benefit which I found to be derived from it, have induced me to call the attention of the profession to its use. Having long since relinquished medical practice I have not now the opportunity of extending my observations. I therefore leave the farther prosecution of the subject to those whose avocation and turn of mind may lead them to pursue it, and I shall feel sufficiently satisfied and rewarded if by this slight sketch. I should be the means of producing a beneficial result.

NEW REMEDY FOR TETANUS AND OTHER CONVULSIVE DISORDERS.*

BY W. B. O'SHAUGHNESSY, M.D., CALCUTTA.

The narcotic and intoxicating effects of hemp are popularly known in various parts of Asia, Africa, and America, where it is extensively employed in a multitude of affections; but in Western Europe the use of hemp is unknown either as a stimulant or as a remedy, probably because the European hemp does not contain any of the resinous matter upon which its therapeutical properties depend. In warm climates, and during certain seasons, a resinous juice exudes and concretes on the leaves, slender stems, and flowers of the hemp. This resin has a fragrant, narcotic odour; bitter, acrid taste; and, when pure, is of a blackish grey color. It is very soluble in alcohol, or fixed oils, and is insoluble in acids.

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* *British and Foreign Medical Review.*

Having determined, by experiments on carnivorous animals, that the remedy might be administered with safety to the human subject, Dr. O'Shaughnessy proceeded to try its effects in several convulsive diseases. The resinous *extract* which he employed, was obtained by boiling the tops of the dried hemp plant in spirit (sp. gr. 835), until the resin was dissolved, and then evaporating the tincture to dryness. The tincture of hemp was prepared by dissolving three grains of this extract in one drachm of proof spirit. The doses vary according to the disease for the cure of which the remedy may be employed. In cholera, Dr. O'Shaughnessy gives ten drops of the tincture every half hour, until the vomiting and purging are allayed. In cases of tetanus, a drachm of the tincture every half hour, until the paroxysms cease, or catalepsy is induced. In hydrophobia, ten or twenty grains of the extract to be chewed by the patient, and repeated according to their effect.

The diseases for which the hemp resin has been administered by Dr. O'Shaughnessy, are rheumatism, cholera, hydrophobia, and tetanus. In the two former complaints the trials hitherto made do not lead to any determinate conclusion. In one undoubted case of hydrophobia the effects of the resin are thus graphically described by Dr. O'Shaughnessy:—

"By his own desire water was brought in a metallic vessel, which he grasped and brought near his lips: never can I forget the indescribable horrors of the paroxysm which ensued. It abated in about three minutes, and morbid thirst still goading the unhappy man, he besought his servant to apply a moistened cloth to his lips. Intelligent and brave, he determinately awaited the contact of the cloth, and for a few seconds, though in appalling agony, permitted some drops to trickle on his tongue; but then ensued a second struggle, which, with a due share of the callousness of my profession, I could not stand by to contemplate. Two grains of hemp resin in a soft pilular mass were ordered every hour; after the third dose he stated that he felt commencing intoxication; he now chatted cheerfully on his case, and displayed great intelligence and experience in the treatment of the very disease with which he was visited. He talked calmly of drinking, but said it was in vain to try, but he could suck an orange; this was brought to him, and he succeeded in swallowing the juice without any difficulty. The hemp was continued till the sixth dose, when he fell asleep, and had some hours' rest. Early the ensuing morning, however, Mr. Siddons, my assistant, was called up to him, and found him in a state of tumultuous agony and excitement. The hemp was again repeated, and again by the third dose the cheering alleviation of the previous day was witnessed. He ate a piece of sugarcane, and again swallowed the juice; he partook freely of some moistened rice, and permitted a purgative enema to be administered. His pulse was nearly natural, the skin natural in every respect. His countenance was happy.

"Four days thus passed away, the doses of hemp being continued. When he fell asleep, on waking the paroxysms returned, but were again almost immediately assuaged as at first. Meanwhile purgative enemata were employed, and he partook freely of solid food, and once drank water without the least suffering. But about three P. M. of the fifth day he sunk into profound stupor, the breathing slightly stertorous; in this state he continued, and without further struggle, death terminated his sufferings at four A. M., on the 27th November."

In several cases of traumatic tetanus, the power of the remedy was triumphantly exhibited. In the first case, symptoms of tetanus supervened on the employment of a moxa, for the cure of dysentery. Two days after their appearance the case was considered hopeless, and the extract of hemp was administered, in the dose of two or three grains, every third, and then every second hour. The spasms were speedily mitigated, and ceased altogether in eleven days. The dysentery proved fatal, however, seventeen days afterwards. The other cases are thus alluded to by Dr. O'Shaughnessy:—

"The *second case* was that of Chunoo Syce, in whom tetanus supervened on the 11th December, after an injury from the kick of a horse. After an ineffectual trial of turpentine and castor oil in large doses, two-grain doses of hemp resin were given on the 26th November. He consumed in all 134 grains of the resin, and left the hospital cured, on the 28th December.

Third case.—Huroo, a female, ætat. 25, admitted into the Native Hospital, December 16th, had tetanus for the three previous days, the sequel of a cut on the left elbow received a fortnight before. Symptoms violent on admission. Turpentine and castor oil given repeatedly without effect; on the 16th and 17th, three grains of hemp resin were given at bed-time. On the morning of the 18th she was found in a state of complete catalepsy, and remained so until evening, when she became sensible, and a tetanic paroxysm recurred. Hemp resumed, and continued in two-grain doses every fourth hour. From this time till the third hour tetanic symptoms returned. She subsequently took a grain twice daily till the 8th February, when she left the hospital apparently quite well.

"Mr. O'Brien has since used the hemp resin in five cases, of which four were admitted in a perfectly hopeless state. He employed the remedy in *ten-grain doses* dissolved in spirit. The effect, he describes as almost immediate relaxation of the muscles and interruption of the convulsive tendency. Of Mr. O'Brien's seven cases, four have recovered.

"In the Police Hospital of Calcutta, the late Dr. Bain has used the remedy in three cases of traumatic tetanus; of these, one has died and two recovered.

"A very remarkable case has recently occurred in the practice of my cousin, Mr. Richard O'Shaughnessy. The patient was a Jew, æt. 30, attacked with tetanus during the progress of a sloughing sore of the scrotum, the sequel of a neglected hydrocele. Three-grain doses were used every second hour, with the effect of inducing intoxication and suspending the symptoms. The patient has recovered perfectly, and now enjoys excellent health."

"The preceding facts (says Dr. O'Shaughnessy) seem unequivocally to show, that when given boldly, and in large doses, the resin of hemp is capable of arresting effectually the progress of this formidable disease, and, in a large proportion of cases, of effecting a perfect cure." We trust that some of our hospital physicians will, without delay, procure the remedy which Dr. O'Shaughnessy has thus favourably introduced, and determine how far it may sustain its reputation as a "powerful anti-convulsive" in this country.

FORMULÆ FOR LOZENGES.

BY MR. BARTLETT, CHELSEA.

NITRE LOZENGES.

3 lb. best powdered sugar; 1 lb nitre powder; ½ drachm smalts; thick mucilage q. s.

OPIUM LOZENGES.

4 lb. sugar powdered, common; ʒij. powdered opium; mucilage q. s. Ft. Troch.

PAREGORIC LOZENGES.

8 lb. sugar powdered, 2nd.; ʒj. drop lake; 1 oz. paregoric; ½ oz. tartaric acid; mucilage q. s.

RED ROSE LOZENGES.

8 lb. sugar powdered, No. 2; ʒj. drop lake; ¾ oz. tartaric acid; 4 drops otto rose; mix with mucilage q. s.

ACID ROSE LOZENGES.

8 lb. best powdered sugar; 1½ oz. tartaric acid; 8 drops otto rose; 1 drachm smalts; mucilage q. s. Ft. Troch.

GINGER LOZENGES.

7 lb. powdered sugar, No. 2; 12 oz. best powdered ginger; mucilage q. s. Ft. Lor.

COUGH LOZENGES.

1 lb. Smyth's soft ext. liquorice; 4½ lb. sugar powdered, No. 3; 1½ oz. liquorice powder; 1½ oz. gum tragacanth powder; 1½ oz. starch powder; 2½ oz. gum arabic powder; 75 drops oil of aniseed. Mix and divide in the form of lozenges or pipe.

ERRORS IN Dr. THOMSON'S CONSPECTUS.

To the Editors of The Chemist.

Gentlemen,—It is truly surprising that a person enjoying the reputation Dr. Anthony Todd Thomson does, should forget himself so far as to send forth a book to the public, and dedicate it "To the Juniors of the Medical Profession," without bestowing on it a look, after it comes out of the printer's hands, to correct the numberless errors with which it abounds. I refer to the last edition of his *Conspectus to the Pharmacopœias*—a book of general reference, particularly by the druggist and junior of the profession. It reflects much discredit on the man who is alike careless of his fellow-men's reputation and lives. In the very first article I turned to, I found a mistake; since which I have observed many more, which I subjoin for the information of the readers of your widely circulated Journal, that they may be induced scrupulously to examine all, before venturing to abide by any of his directions for compounding or dispensing.

First, then, in the Conf. Opii. the ʒij P. Tragac. is altogether omitted, and a pint of syrup ordered instead of ℥xvj.

The Conf. Aromatica of the last Pharmacopœia is ordered to be kept in a *dry state:* but Dr. Thomson says No, you must add the *water* in spite of the College.

In the Mistura Ferri Comp. there is but *one drachm* of sacch. pur. ordered instead of *two*. In the Mist. Gent. Comp. ℥ij of Inf. Gent. Comp. which should be ℥xij.

In Mist. Guaiaci.—Aq. Cinnam. ℥ix for ℥xix.

In Pil. Aloes. Comp.—Aloes Pulv. ℥ss for ℥i Pilulæ Galbani Comp. in the wrong place, it ought to be after the Pil. Ferri, to read right in *operation of*.

In the Tinct. Ammoniæ Comp., ounces are ordered for drachms in the *Mastich(es)* and Spirits Wine.

In the Tinct. Aurantii, rectified spirit is ordered for proof!

In Tinct. Camph. Comp., 34 grs. of opium and benzoic acid ordered, instead of 72 grs., and the ʒj ol. anisi left out.

Tinct. Kino, proof, instead of rectified spirit.

Vinum Opii, ʒij Cort. Cinnam. and Caryophyll. ought to be ʒiiss.

In Vin. Antimonii Tart., he orders 24 grs. to a pint of wine, then tells us every ℥j contains two grains Ant. Tart.

The Inf. Pareiræ, he cannot tell you how to make: it is ʒvj of the radix to a pint aquæ.

Liniment. Terebinthinæ, there is ℥iij soap, for ℥ij.

With many &c.'s which, with your permission, I will take another opportunity of pointing out.

I remain, Gentlemen,
Your much obliged Servant,
Vauxhall, July 15, 1840. J. H.

ON THE PRESENCE OF COPPER IN THE HUMAN VISCERA.*

BY SIGNOR CATTANEI.

The existence of copper in organic matters has been, as our readers may have remarked, the subject of the investigations of many chemists: Vauquelin, Chevreul, Sarzeau, Bouchardat, Orfila, Devergie, and Hervy. Positive facts seem to demonstrate that this metal exists in animal matters, in appreciable quantity, and that it may be detected by the nitrate.

The presence of copper in the viscera has lately been made the subject of critical remarks by Signor Cattanei, professor of general and pharmaceutical chemistry in the University of Pavia, which were published in the *Annali Universal di Medicinali*, for April 1840.

As these remarks, and the inferences which may be drawn from them, may be useful in medico-legal cases, we give insertion to them:—

In January 1839, having read the communication which M. Devergie had made to the Academy of Medicine of Paris, concerning the natural existence of copper in the human organs, I felt desirous of verifying the facts experimentally, for it was requisite to do so with a thing which would have judicial applications of such vast importance. I therefore associated myself with my colleague, M. Camille Platner, professor of legal medicine, and medical police, and we agreed to operate in concert. One reflection immediately presented itself; this was to ascertain whether the matters which we sought were congenital, that is to say, an elementary and natural part of our tissues, or whether they were accidentally introduced by food cooked in copper vessels, covered with tin, which contains, as is known, a certain portion of lead. We consequently thought it advisable to make our first experiments on the viscera of children, which had but a short time survived birth, and which had been nourished only by the maternal milk.

On the first of February, we procured a stomach and intestinal tube, from the body of a fœtus born at the seventh month, which had lived only two days, and which had taken nothing but its mother's milk, and died of apoplexy.

On the 8th, we received the lungs, heart, and digestive canal of a second fœtus, also born at the seventh month, and which likewise died of apoplexy, two days after birth.

On the 22d, we were furnished with the lungs, intestinal tube, liver, and spleen of a little girl, born at the proper period, who died of hydro-pericarditis twenty-five hours after birth: she was fed entirely on her mother's milk.

The digestive canals of the three infants, the heart and lungs of the second and third, and the liver and spleen of the third, were separately carbonized in Hessian crucibles. We chose this instrument in order to avoid the objection which might have been made, of our obtaining the copper with which the silver might have been alloyed, had we used crucibles of that metal; or of having obtained the lead from the glazing, if we employed porcelain crucibles. The carbonization of the animal matters being quite completed, we proceeded to their incineration. In order to facilitate the latter, which is always tedious and difficult, and I may almost say, incomplete, we used nitric acid to some, and to others, chlorate of potassa, in order to compare the results.

On the ashes which we thus obtained, we poured acetic acid, and aided its solvent action, by heat. An excess of ammonia was added to the liquids, and, by standing, they became perfectly limpid, and were separated from their deposit, by means of decantation. The liquid portion did not present any blue tint, nor did it give the least precipitate by means of the double yellow cyanuret of potassa, nor with hydro-sulphuric acid: iron immersed in it did not show the least trace of copper. We must therefore conclude that these liquids did not contain even the smallest quantity of copper.

We afterwards dissolved in acetic acid the matters which remained from the decantation, and which were separated by means of ammonia. Into each of the liquids obtained and rendered limpid by filteration, we poured iodide of potassium, chromate of potassa, and hydro-sulphuric acid; we also put in a sheet of zinc. The only one of these reagents which gave us any suspicion of the existence of lead, was the hydro-sulphuric acid; it gave the liquids a light brown tint. However, in order better to understand the nature of the deposit, we dissolved it in very dilute hydro-chloric acid, and we poured into the liquid a solution of yellow ferrocyanuret of potassium; this gave a blue precipitate, which made us conclude that the brown color of which we have just spoken, depended on sulphuret of iron.

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* *Journal de Chimie Médicale*, July 1840.

Consequently, we have been obliged to conclude that the viscera which we examined did not contain any trace of copper or lead.*

After this first work, we undertook the analysis of the viscera of adult subjects, in order to ascertain the degree of confidence which might be placed in the results obtained by M. Devergie. We remitted this examination for a few days, when, in the mean while, fell into our hands (April, 1839) the report which MM. Caventou, Pelletier, Dumeril, and Delens had made concerning M. Devergie's work to the Royal Academy of Medicine, at the sitting of the 26th of February, 1839. The Commission having declared that the facts advanced by M. Devergie were not conclusive, we did not think it necessary to go any farther. Our experiments, however, have not been the less important; for, supposing that new investigations should tend to confirm M. Devergie's assertions, the problem relative to the congenital or accidental origin of the metals in question, would be found already in the way of solution, and we understand the medico-legal tendency that such a solution would have.

CHEMICO-LEGAL INVESTIGATIONS CONCERNING MORPHINE.

Iodic acid has been highly spoken of as a means of detecting the presence of morphine, which has the property of deoxygenizing it, and liberating the iodine. The following observations have led Mr. Davidson to deny its utility in this respect:—

Some months ago, in examining the urine of a patient, he discovered that by adding a little iodic acid, it acquired the odour of iodine, and that with starch it assumed a blue tint. He then endeavoured to ascertain which of the elements of urine possessed this property; he tried urea and uric acid, and found that the latter alone possessed it, and might thus be detected as well in the urine of healthy persons, as in that of invalids.

He afterwards tried the effects of iodic acid on the serum of the blood, and obtained similar results, but more slowly: the tint was not so deep as that of the urine of healthy persons.

All the albuminous fluids which he examined, furnished the same results; the only difference was in the intensity of their color. He observed the same facts in the serum of the brain of a man who had died of typhus fever, in the liquid procured by tapping, from a person affected with peritonitis, from a dropsical patient, in the serum of the milk of a heifer, &c. The serum of blood, even when mixed with four or five parts of water, gave, with iodic acid and starch, the same color, and even more beautiful, as when alone.

From these facts it appears that iodic acid is capable of being decomposed by substances which exist in abundance as elements of our food, and as a constituent part of the animal fluids and solids. One of these secretions, urine, contains a substance which produces the same effect. Therefore, in analyzing substances contained in the stomach, in cases of poisoning by morphine or opium, the certainty of finding albumen in it, and the possibility also of meeting with uric acid, can only render the separation of morphine from these two substances difficult and complicated, and even doubtful, for iodic acid can no longer be considered as a test for it.

ON THE MEADOW NARCISSUS, AND ON AN ACTIVE AND VOMITIVE PRINCIPLE, NARCITINE.*

BY DR. JOURDAIN.

It is well known that the meadow narcissum (*narcissus pseudo narcissus*), has lately been the subject of many experiments.

1st. M. Loiseleur Deslonchamps endeavoured to discover the vomitive property of the bulbs and flowers, with the view of employing these indigenous products as substitutes for ipecacuanha; but the therapeutical experiments which he tried, did not permit his proving the presence of a vomitive principle in this plant.

2nd. MM. Avuret and Waltecamp, physicians at Valenciennes, assert that they have successfully employed narcissus flowers in the dose of 12 to 15 decigrammes, for producing vomiting.

3rd. M. Dufresnoy has also asserted that the extract obtained from the flowers had a vomitive action in the dose of from 5 to 15 centigrammes.

4th. M. Caventou, who analyzed this plant, did not detect its vomitive property:

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* We have ascertained and proved that the viscera of adults do sometimes contain copper and lead, and that at others they do not. New investigations must be made.

† From the *Journal de Chimie Médicale.*

he perceived by analysis that it was composed of a fatty, odorous matter, of a yellow coloring principle, of gum and of vegetable fibre. M. Charpentier found in it a resin, gallic acid, mucilage, extractive and ligneous matter, and muriate of lime.

Dr. Jourdain attributes the properties of the meadow Narcissus to a peculiar principle, narcitine, whose properties he thus describes :—

This substance is white, sweet, and transparent, with very little taste and smell; it is deliquescent, soluble in water, alcohol, and vinegar. The dried scales (*squames*) of narcissus contain almost half their weight of narcitine. This principle is less abundant in the flowers.; the stem contains a great quantity of it before the development of the flower; when it begins to fade it contains nothing more than a little gum : it is the same with the leaves. It is quite different with the bulb, which is less rich in extractive matter during vegetation: in this principle resides the emetic virtue of the meadow narcissus.

Dr. Jourdain has seen in his experiments, that the peculiar principle, narcitine, exists in the *narcissus poeticus* and *tazetta* in almost the same proportions as in the meadow narcissus. The *narcissus jonquilla* contains a less viscous matter than the above species.

The dried bulb of the meadow narcissus contains in the 100 parts :—

Narcitine	37
Gum..............	6
Tannin............	24
Ligneous matter	28
Saline substances ...	,,
A volatile oil	,,

The flowers contain but 25 per cent. of narcitine.

Dr. Jourdain's opinion, which coincides with that of MM. Avuret, Waltecamp, and Dufresnoy, in establishing that the active principle of the narcissus is vomitive, is contrary to the facts observed by MM. Loiseleur Deslonchamps, and Caventou; it would, therefore, be useful to resume this subject, and to ascertain whether the narcissus which grows in the department of the Seine is possessed of other properties than that described by the physicians of Valenciennes and Dr. Jourdain.

DETECTION OF THE ADULTERATION OF ESSENTIAL OILS WITH ALCOHOL, BY MEANS OF CHLORIDE OF CALCIUM.*

BY M. BORSARELLI.

The author uses a small cylindrical tube of about three centimetres in diameter, and twelve in height, closed at one end. He fills it to two-thirds with oil, and introduces into it small pieces of chloride of calcium, well dried, and quite free from dust; he then corks the aperture of the tube, heats it to 100° C. for about four or five minutes, in the sand-bath, repeatedly stirring it, and he afterwards allows it to cool slowly.

If the essential oil contain much alcohol, the chloride entirely dissolves, and forms a thick layer at the bottom of the tube, while the oil remains above. If it contain only a very small quantity of alcohol, the pieces of chloride of calcium effloresce, lose their form, and reunite at the bottom of the tube in a white and adherent mass. Finally, when it is quite pure, the pieces of chloride of calcium remain unaltered in their form.

It is well to observe that when it is wished to test an essential oil, a very small quantity of chloride of calcium should at first be employed, and more of it gradually added, lest, if the proportion of alcohol should be very small, it be not absorbed by the chloride, without perceptibly modifying it, and without being able to prove its existence. In all cases it is easy to determine the proportions of a mixture of alcohol and essential oil, by comparing its weight or volume with that of the pure oil which floats on the alcoholic solution of the chloride, when the operation is terminated.

The same process, adds the author, may also be used for ascertaining the quantity of alcohol which ether contains; employing, however, a longer tube, and not quite so accurately corked.

MODE OF DETECTING THE ADULTERATION OF OLIVE-OIL AND OIL OF SWEET ALMONDS, WITH OIL OF POPPIES.†

BY A. LIPOWITZ.

The action of protonitrate of mercury on olive-oil, proposed by M. Poutet, was rejected, because poppy-oil, when acted upon this by salt, undergoes the same modifications. Poppy-oil, mixed with olive-oil, which, beaten together, should throw up bubbles produced by the former, is too empirical and too insufficient an operation : Rousseau's diagometer is too difficult a process.

M. Lipowitz thinks that this adulteration may be detected by means of chloride of lime ($C^2\ C^2\ 1\,O^8$).

When 8 parts of the suspected oil are triturated with 1 part of chloride of lime, a short time after being agitated in a cylinder, the mixture, in cases where there is only

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[*] *Revue Scientifique et Industriel.*

[†] *Journal de Chimie Médicale*, June, 1840.

olive-oil, or oil of almonds, separates into two perfectly distinct layers, the upper of which is pure bleached oil; the lower is the whole mass of chloride of lime with a little oil. In at most four or five hours, and at a temperature of 14-15° R., the mixture is separated into two equal parts, and in eighteen hours the two parts of oil are quite distinct and clear.

When, on the contrary, poppy-oil is triturated with chloride of lime, there is no perceptible separation of the mixture, even after some days. I have profited by this property of these different oils to detect poppy-oil in olive-oil and oil of almonds, and I have found that these oils, adulterated with $\frac{1}{8}$ of poppy-oil, show, after one hour, scarcely any separation; it does not commence until it has stood for above six hours, and it is only after eighteen hours that $\frac{1}{3}$ is found in the oil of almonds and in the olive-oil, half of the volume. A mixture containing more than $\frac{1}{8}$ of poppy-oil shows hardly any difference from pure poppy-oil, and it is very long before any separation is perceived. A mixture of equal parts of these oils acts exactly like poppy-oil.

This adulteration is more distinctly detected by adding an equal quantity of water to the above mixture, and the oil of almonds, agitated with chloride of lime and water, is separated into two parts, in which, ten minutes after, the whole quantity of water is found, rather milky, at the bottom, and the upper layer is a mixture of the chloride and oil. The same separation occurs, but less readily with olive-oil; and by frequently agitating, the two mixtures flow easily. Poppy-oil, stirred with chloride of lime, forms, on the contrary, a saponification so solid as to attach to the sides of the vessel. A mixture of oil of almonds and $\frac{1}{8}$ of poppy-oil, forms a saponification, the water of which easily flows off, whilst the vessel remains covered with the oily mixture, which does not do so.

BLISTERING TISSUE.

To the Editors of The Chemist.

10th July, 1840.

Gentlemen,—As there is a new mode of blistering resorted to, and one which, from its numerous advantages, is likely, when generally known, to supersede the use of the old Emplast. Cantharid., might I take the liberty to enquire whether any of your readers are acquainted with it?

It consists of simply laying a piece of thin paper upon the part, and in the course of twelve hours it acts as a powerful Epispastic, producing much less pain than the common plaster. To appearance, it seems to be tissue paper, which has been dipped in some colourless fluid, and carefully dried. The operation altogether is comparatively so cleanly and pleasant, that most people would, I think, prefer it.

I am practically aware that the acetate of cantharidine, will, in most cases, produce a blister in about half the time usually required by the old plaster; but it is necessary in this instance to moisten a piece of linen, (cut the size required), place upon the part and cover it *immediately* with oiled silk or cloth, to prevent evaporation. Strangury is, I believe, more likely to be produced by rapid blistering, but might in a great measure be obviated by the introduction of opium or of camphor.

I know of only one individual who makes the paper successfully for this new mode of blistering, and which he keeps a great secret. Now, the mystery connected with the subject is, 1st, what solution of cantharidine he employs? 2d, the mode of combination by which he is enabled to impregnate the paper? and 3d, how is the paper preserved so as to retain this preparation in its pristine power?

Answers to the above, from any of your correspondents, will be esteemed a favour, by, Gentlemen, your most obedient servant,

J. M.

[If our correspondent will refer to *The Chemist*, No II. page 59, he will, we think, find what he wants: common blotting paper may be slightly saturated with the ethereal tract of cantharides. We think it should not be kept long before being used. M. Trousseau used some which had been kept for fifteen days in the open air: he found it very efficient, even at the expiration of that time.]

ON SULPHATE OF COPPER AS A VOMITIVE.*

It is well known that sulphate of copper has lately been employed as a vomitive. A case of poisoning by opium has been published, in which 7½ decigrammes of sulphate of copper, given as an emetic, saved the patient.

Alston and Hahnemann prefer it to emetic. F. Hoffman gave it in broth, in the dose of a decigramme, and even more. Seuter associated it with ipecacuanha. Marjat combined its use with that of emetic.

M. Toulmonche, of Rennes, has lately published a work on this salt, considered as a vomitive, in which he comes to the following conclusions:—

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* *Journal de Chimie Médicale*, July 1840.

1st, In the dose of 10 centigrammes (2 grains), sulphate of copper causes vomiting eleven times out of twelve; but the number of vomitings varies only from one to three.

2d, In the dose of 20 centigrammes (4 grains) its action as a vomitive is certain and uniform, since it failed in its effect only four times out of thirty-seven.

3d, In the dose of 30 or 40 centigrammes (6 or 8 grains) it is more certain than stibial tartar, since, in this dose, it has never failed in its effect.

4th, Its administration in these doses is not more dangerous than that of the salt of antimony.

5th, Its purgative action can certainly be depended on to produce it separately (that is to say, without being preceded by vomiting), only in one case out of three; moreover, this salt provokes colics, in general slight, but sometimes more intense, so that it would irritate the intestinal mucus, only in a weaker manner.

ON THE FLOWERS OF KWOSO AND THEIR VERMIFUGE PROPERTIES.*

M. Theodore d'Abbadie, known in the scientific world by various communications to the Academy of Sciences, some months since brought a young negro from Abyssinia, who some time before his departure, felt himself attacked with a tape-worm.

This negro, in consequence of the hurried preparations for the voyage, had been able to furnish himself with but a small quantity of the flowers which in his country are called *kwoso*, and which possess vermifuge properties in a high degree.

When he found himself tormented by the worm, he took ten grammes of these flowers reduced to powder, in a glass of water; some hours afterwards he felt the worm agitated in his stomach, and next day he voided it by stool.

M. d'Abbadie, thinking that this plant might be useful in medicine, requested us to examine it. After having treated the kwoso flowers by water, alcohol, and ether, we found that this plant contains:—

1st. A saccharine matter.
2nd. Starch.
3rd. An extractive vegetable matter.
4th. A green and very odorous resin.
5th. Crystals soluble in water, and in alcohol; these crystals redden turnsole paper.

Having but a very small quantity of these flowers, we regret being unable accurately to ascertain the nature of the crystals obtained.

We hope that, for the good of society, this note will attract the attention of practitioners, and particularly that of MM. Petit and Lefebvre, who at the present time are in Abyssinia, making scientific investigations.

The kwoso flowers are produced by a tree three metres in height; it occurs chiefly in the damper parts of Abyssinia.

M. d'Abbadie thinks that it belongs to the family of malvaceæ: we could not confirm this fact, as the flowers were too much injured.

PRIZES PROPOSED.

At the sitting of the *Société de Pharmacie*, M. Bassy, in the name of the committee of prizes, proposed that a prize of 1000 francs be again offered for the discovery of the active matter of Digitalis:

That a similar prize be also offered for the discovery of the active matter of Ergot of Rye.

These propositions were adopted by the Society.

The memoirs, written in French or Latin, must be addressed, post-paid, to M. Soubeiran, secretary to the Society, Rue de l'Arbalete, Paris, before the first of August 1841.

FORMULA FOR THE TREATMENT OF ITCH.

BY RAFFAEL NAPOLI.

R. Chloride of lime.... 500·00
Dilute it with from . 1500·00 to 2000·00
Leave the mixture for two hours.

Afterwards strain the liquid through a cloth, and use it externally.

Compresses are steeped in this water, and are applied to the affected parts. Each compress is covered with a second cloth steeped in strong vinegar. As the cloths dry they are again wetted. This treatment is continued until all the liquid is consumed, when the patient is radically cured. In some cases, though very rarely, the treatment requires to be recommenced.

WALCH'S TONIC ASTRINGENT PILLS IN BLENNORRHŒA AND LEUCORRHŒA.†

R. Venetian Turpentine }
Extract of Gentian } āā gram. 8·00
Sulphate of Iron . }
Kino . . } āā „ 6·00
F. S. A. pills of one decigramme each.

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* *Bulletin de Therapeutique.*

† *Journal des Connaissances Médicales*, June 1840.

These are very beneficial in blennorrhœa and in chronic leucorrhœa.

Four pills to be taken, three or four times a-day.

ON THE USE, AS FOOD, OF THE FLESH OF ANIMALS WHICH HAVE DIED OF DISEASE.*

Mr. J. C. Albers of Berlin, in the 2nd and 3rd Nos. of Vol. 55 of *Rut's Magazin für die Gesammte Weilwunde*, has endeavoured to prove, from numerous facts related by different authors, and from his own observations, that the flesh of animals labouring under either epizootic or sporadic affections has with impunity been eaten by man: he is of opinion that, in cases where ill effects have been remarked, they are always owing to other circumstances: for instance, he has known individuals die of eating *bad pickled* meat, which had undergone putrid fermentation in the casks in which it had been kept and salted.

SOLUTION OF EXTRACT OF HEMLOCK IN SCROFULOUS OPHTHALMIA.†

The following preparation is recommended by Vop, of Hanau, in cases of scrofulous ophthalmia:—

Extract of hemlock.
Spirituous cinnamon water.
Dissolve.

It is given to children of three or four years of age, and even older, in doses of four drops of this solution, three times a day, adding a drop every day to each dose. Blisters behind the ears, and the use of compresses of tincture of thebaïa are ordered at the same time.

Professor Otto, of Copenhagen, has used this medicine with complete success in more than thirty cases of scrofulous ophthalmia: he has increased the dose to thirty or thirty-five drops, without any injurious results.

BITTER DRAUGHT AGAINST STOMACHIC OLIGOTROPHY.

BY DR. PLISSON.

R. Peruvian bark	.	gram.	10·00
Columbo root Rhubarb Aniseed	ā ā .	,,	4·00
Wormwood leaves	.	,,	2·00
Calcined magnesia	.	,,	1·50
Common cold water	.	,,	1000·00

Leave in maceration for twelve hours and filter through blotting paper.

Dose: A Bourdeaux wine glassful, three times a day, before the two principal meals.

This is a very agreeable and efficacious preparation in dyspepsia, anorexia, weakness and languor of the stomach.

It may be enquired what part in this composition does the small quantity of magnesia perform, since it is removed by filtration. Dr. Plisson, foreseeing this objection, replies that although the oxide of magnesium is almost insoluble in water, it is, however, partially dissolved in it, particularly the portion which is combined with acids of some of these substances, and with the volatile oils of others, and that in all cases, it is not indifferent to prescribe or not to prescribe it in this formula, seeing that the aqueous liquid is charged with a much greater quantity of extractive matters by aid of this addition.

TO CORRESPONDENTS.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month.*

J. T. will find a method of preparing lactate of iron in "The Chemist," No. V., page 160.

A SUBSCRIBER, Glasgow.—Muriate of Morphia may be formed by the direct action of muriatic acid on anhydrous morphia.

"SCHEELE."—We regret being unable, at present, to give the information required. We will, however, endeavour to obtain it.

W. F. W.—Red ink may be made by boiling two ounces of Brazil wood in a pint of water for fifteen or twenty minutes, and then adding a small quantity of gum and alum. The finest red ink is that prepared by digesting cochineal in a very dilute solution of ammonia.

The kind favour of our correspondent at Tetbury was received just as we had completed our number. It will appear in our next.

Second Editions of Nos. I. II. and III. having been completed, may now be had of our publisher.

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* *Journal Chimie Médicale*, June 1840.

† *Wochenschrift für die gez. Heilkunde.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

THE CHEMISTRY OF MOUNTAINS. THEORY OF THEIR FORMATION.*

BY EDWARD BENTLEY,

Fellow of the Microscopical Society of London, and Operative Chemist to H. R. H. the Duke of Cambridge.

> " Omnia mutantur nil interit .....
> Nec manet ut fuerat nec formas servat easdem,
> Sed tamen ipsa eadem est."

NOTWITHSTANDING the late rapid progress of Geology, it still remains a problem whether the mountains of the earth have been formed by volcanic forces, such as exist at the present time, or by the agency of central fire. The majority of modern geologists, with Monsieur Cordier at their head, have adopted the latter opinion, because it has been found that the temperature of the earth increases in some proportion as we descend below the surface, and that in deep mines, the water issuing from the surrounding strata is from 20° to 30° warmer than that of superficial springs. From such data it has been inferred, that the temperature of the earth augments about 1° for every 45 feet of descent, making 212° at the depth of 12 miles, and increasing in the same ratio to the centre, where everything is in a state of fusion and incandescence, and that all mountains have been upheaved by the expansive force of this immense furnace. But with due deference to the high authorities in support of this hypothesis, I shall venture to offer a few brief observations, with a view of shewing its insufficiency to explain the more important phenomena of Geology.

In the first place, if the mountains of the globe were elevated by the agency of a central fire, they ought to be much higher than they are.

Secondly. All the loftiest mountains of our planet are confined to the tropical regions, and diminish in magnitude on to the polar circles, where their average height is from four to five times less than in equatorial India, Africa, and South America, as may be shewn by reference to the best recent works on physical geography. But if the vast chains that girdle our planet were upraised by a central fire, it is impossible to comprehend " why the polar mountains should not be as high as those of the tropics, for the former are actually nearer the centre of the earth."

Thirdly. It has been supposed by Geologists that the earth originally existed in a state of red-hot fusion throughout, and has ever since been cooling down, because the fossil organic remains of the older sedimentary formations in the northern hemisphere indicate a much higher mean temperature than exists at present. To this hypothesis it may be answered, that a gradual change in the inclination of the earth during long geological epochs, would explain the phenomenon in a more satisfactory manner; and even admitting that we have no actual proof of such a change, the predominance of land in the tropical, and of water in the polar regions, would so far modify the physiological conditions of the globe, as to permit the existence of plants and animals in high latitudes, the representations of which are now found only in the torrid zone, as mentioned by Mr. Lyell. Besides, it is admitted by Fourier, that if the earth had been projected into a medium 58° below zero at any given temperature, it would not cool more in 1,280,000 years than a globe of 1 foot in diameter, composed of the same materials, and placed in like circumstances, would in a second of time.

Fourthly. That the volcanic action by which mountains are elevated is generated by chemical action at no great depths beneath the surface, would appear from the well-known fact, that all the volcanoes now in existence are found to be submarine, or situated in the vicinity of the ocean, and abound with marine salts; which clearly shews that the action of sea-water is indispensable to their activity, and if so, it is evident that they cannot be owing to central fire.

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* Communicated by the Author.

It is also worthy of notice, that volcanoes are far more numerous and active in the tropical than in the middle and higher latitudes: from which we are authorised to conclude, that the subterranean action by which they are generated, like all the chemical and vital transformations on the surface of the globe, is governed by temperature.

The vast importance of mountains in the economy of nature, would appear from a variety of considerations. They are not only the source of rivers, but of the precious metals and gems, which are forced up from the interior portions of the earth to its surface, and placed within the reach of man.

What can be more grand and impressive than the immense chains of granite and porphyry that extend for hundreds and thousands of miles in length, while they modify the directions of winds, the temperature of climates, and seem as the boundaries of nations? Were it not for mountains, the sea would everywhere prevail, causing a gloomy waste of land and water. There could be no rivers or springs, nor any of that beautiful variety of hill and dale that now adorns the surface of the earth, and renders it the delightful abode of sentient beings.

As the composition of organized beings is renewed by the removal of its tissues, by absorption, into the general circulation, so is the surface of the earth perpetually renovated by the disintegration of mountains, which are gradually worn away by the action of running waters, and transported into valleys, lakes and seas, forming new lands. Thus it is, that all the phenomena of meteorology, chemistry, geology, and physiology, are immediately connected with the natural history of mountains.

> "Old things pass away, and all things become new."

The air, the ocean, and the earth, are for ever in motion, under the government of wise and beneficent laws, which pervade the whole system of nature in a state of undecaying vigour and youthful beauty.

ON THE DIFFERENT OBSTACLES PRESENTED IN THE EMPLOYMENT OF PHOSPHORUS AS AN EUDIOMETRICAL MEANS.—ACTION OF CARBURET OF SULPHUR, OF CREOSOTE, OF EUPIONE, AND OF SULPHUROUS ACID, ON PHOSPHORUS.*

BY M. VOGEL, JUN.

It is a well known fact that phosphorus melts in chlorine, and that it inflames spontaneously in that gas, and burns in it with a whitish and not very brilliant flame, forming chloride of phosphorus.

Mr. Graham, professor of Chemistry in the London University, first observed that phosphorus lost its property of being luminous, in an atmosphere mixed with a small quantity of chlorine. This phenomenon induced Mr. Graham to examine the action of some other gases on phosphorus, and he obtained many very interesting results. He observed, for example, that in an atmosphere containing olefiant gas, sulphuretted hydrogen, or vapours of ether or oil of turpentine, phosphorus shone very feebly, or even ceased to shine at all, in the dark.

I proposed to myself to repeat Mr. Graham's experiments, and to add, if possible, some new facts to those noticed by that chemist.

Wishing in the first place to determine the quantity of chlorine sufficient to prevent phosphorus from being luminous, I introduced a piece of phosphorus, fixed to the point of a glass tube, into a graduated bell-receiver containing 25 cubic inches of air, and placed over water. While the phosphorus was tranquilly shining in this air at a temperature of 12°·5 C., I added to it 3·5 cubic inches of chlorine. In about a minute, the phosphorus entirely ceased to be luminous in the dark; but when the water had dissolved 1·5 cubic inches of chlorine, and consequently there remained but 2 cubic inches of chlorine mixed with the air, the phosphorus again began to become luminous. From this experiment it results, that phosphorus ceases to be luminous in air composed of 100 volumes of pure air and 8 volumes of chlorine.

When a dry piece of phosphorus is introduced, in an iron spoon, into air mixed with a fifth or sixth of its volume of chlorine, it soon begins to fuse at the temperature of + 8° C. When it is completely melted, it inflames spontaneously, and burns, not with a whitish, feeble, and dull flame, but with a very vivid and brilliant one; at the same time there are formed chloride of phosphorus, red oxide of phosphorus, and phosphoric acid.

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* *Journal de Pharmacie*, July, 1840.

According to analogy, it might be conceived that bromine would exert the same influence as chlorine on phosphorus, but experiment has not confirmed this opinion. In a flask of air containing vapours of bromine, phosphorus shines at a temperature of + 10° C. less powerfully, it is true, than in pure air, but the disengagement of light never entirely ceased. If the temperature be increased to + 18 C., the phosphorus melts without inflaming.

ACTION OF CARBURET OF SULPHUR ON PHOSPHORUS.

A piece of phosphorus, which was luminous and surrounded by white vapours, in a bell-receiver full of air, slightly damped and placed over water, ceased to be luminous the moment that a small open vessel containing a drop of carburet of sulphur was passed under the glass.* During the space of four days not the slightest trace of light was observed. The same piece of phosphorus, removed from the atmosphere charged with carburet of sulphur, and placed, without having been washed, in other bell-glasses filled with fresh air, did not begin to become luminous. It might even be left several days in contact with the air, without commencing to be surrounded with white vapour, or to become luminous in the dark. It was only after having been well washed with water, and dried by means of blotting paper, that it acquired the property of being luminous in fresh air.

The smallest quantity of carburet of sulphur is sufficient to produce this effect on phosphorus; for if a drop of it be poured on paper, and if a slip cut from this paper be rapidly introduced under a bell in which phosphorus is disengaging light, this light is completely extinguished.

The influence of carburet of sulphur on the luminosity of phosphorus is so great, that the temperature may be raised until the phosphorus fuses = 35·8 C., and even higher, without the slightest phosphorescence being observable in the dark.

According to these results it must be admitted that carburet of sulphur is one of the fittest substances for preventing the slow combustion of phosphorus.

When a piece of paper is moistened with a solution composed of two parts of phosphorus, and one of carburet of sulphur, the paper does not commence to become luminous for a few minutes, that is to say, the disengagement of light is not manifested until the carburet of sulphur is completely evaporated. This phenomenon results from the evaporation of the liquid causing a great diminution of temperature, which opposes the slow combustion of the phosphorus. Besides, carburet of sulphur itself presents, as we have just seen, a powerful obstacle to this combustion. The phosphorescence of the abovementioned paper, once commenced, gradually increases, until the paper inflames of itself in the air.

A strip of blue turnsole paper steeped in carburet of sulphur charged with phosphorus, and exposed to the air, does not shine immediately; but as soon as phosphorescence commences, the paper becomes red, and, soon after, combustion ensues.

INFLUENCE OF CREOSOTE AND EUPIONE ON PHOSPHORUS.

When a piece of phosphorus is left in a small flask filled with creosote, in a dark place, without elevating the temperature, it is found, at the expiration of 24 hours, that the creosote has dissolved sufficient phosphorus for nitrate of silver to produce in it a black precipitate, and for a piece of paper, damped with it, to shine in the dark. The colorless creosote, kept in a flask, with a piece of phosphorus and a little air, assumes, after a few weeks, a black color, and acquires a thicker consistence. In this state it reddens turnsole paper, and contains a free acid of phosphorus.

When a strip of paper, previously steeped in creosote, is introduced into a flask containing a piece of phosphorus luminous in the dark, without touching the phosphorus, the latter immediately ceases to produce white vapours. With respect to the surrounding light, no diminution in its intensity is at first observed, but at the expiration of about twenty minutes, it begins gradually to diminish, and in an hour it entirely ceases.

Eupione acts on phosphorus in nearly the same manner as creosote does; its action, however, is not so energetic. In order to prevent the slow combustion of phosphorus, by means of eupione, more of it must be employed than of creosote, and it must be allowed to act for nearly double the time.

A piece of phosphorus was kept for several days in a flask containing eupione. During this time, the eupione lost none of its transparency: when decanted, it contained a certain quantity of phosphorus in solution: nitrate of silver formed in it a black precipitate, and a strip of paper steeped in this liquid became luminous in the dark.

INFLUENCE OF SULPHUROUS ACID GAS ON PHOSPHORUS.

When we add to air in which phosphorus shines in the dark, $\frac{1}{12}$ of its volume of sulphurous acid gas, after five minutes the phosphorus entirely loses its luminous state, and, in this mixture, does not resume it.

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* All the experiments were made at a temperature of from + 8° to + 10° C.

In turning into water the flask which contains this gaseous mixture and phosphorus, so that the water may gradually enter into it and dissolve the gas, the phosphorus does not recommence to shine feebly until the sulphurous acid gas is completely dissolved. The small quantity of this gas which surrounds the surface of the phosphorus seems to be sufficient to prevent its combustion: it is only after being well washed and dried that it becomes luminous in a fresh quantity of air. It is not even necessary to make sulphurous gas pass into the flask; a small quantity of an aqueous solution of this gas, introduced into a flask containing 100 cubic inches of air, in the midst of which phosphorus is shining, is capable of preventing its combustion. It might be supposed that phosphorus does not burn in an atmosphere impregnated with sulphurous acid gas, because the oxygen has already been absorbed to change the sulphurous into sulphuric acid: but this supposition is unfounded, for on examining the mixture of air and sulphurous acid gas in which phosphorus had ceased burning, I found that the air had lost scarcely any of its oxygen. When the temperature of the phosphorus is raised to + 18° C., in a flask filled with a mixture of air and sulphurous gas, the phosphorus begins to burn, and fuses at this temperature, which is much lower than that of fusion in the air. This phenomenon seems to be analogous to that long ago remarked, that the fusibility of phosphorus is different in nitrogen and in hydrogen gases.

I left a piece of phosphorus in a flask containing liquid sulphurous acid, for the space of three weeks. At the end of that time the phosphorus had changed color and was covered with a yellowish layer: the sulphurous acid, when decanted off, contained traces of phosphorus in solution.

Mr. Graham is of opinion that the action by which certain gases prevent the oxidation of phosphorus is in some measure related to that of some gases which impede the inflammation of the detonating mixture of oxygen and hydrogen gases, by means of the electric spark. I am far from wishing to contest this opinion, but I think, nevertheless, that it is possible otherwise to explain the phenomena pointed out. The luminosity of phosphorus results only from its combustion,—that is to say, from its union with the oxygen of the atmosphere. But if there be in the atmosphere gases or vapours for which phosphorus appears to have, at the ordinary temperature, more affinity than it has for the oxygen of the air, it unites in preference with these bodies. Whence it follows that its combination with oxygen cannot be effected, and, consequently, it cannot become luminous.

In support of this way of viewing the phenomena, I might also mention the solubility of phosphorus in olefiant gas, which gas, as we know, is opposed to all phosphorescence. After having left a piece of phosphorus in this gas for some minutes, it was covered with a yellowish white layer, and became red in the interior. On examining the gas, I found that it contained a certain quantity of phosphorus in solution, for nitrate of silver agitated with it gave a black precipitate.

On recapitulating the substances which prevent phosphorus from becoming luminous in the air, we find that their number is very considerable. Mr. Graham has shown that phosphorus is stopped in its slow combustion at + 18 ° C., and under the ordinary pressure of the atmosphere, by:—

1 vol. of olefiant gas in 450 vol. of air:
4 vol. of chlorine in 100 vol. of air:
20 vol. of sulphuretted hydrogen in 100 vol. of air:

And that the vapours of sulphuric ether, of naphtha, and of oil of turpentine, still more powerfully oppose phosphorescence.

The substances which may be added, according to my experiments, to those already pointed out by Mr. Graham are as follows:—

1. Carburet of sulphur: sudden cessation of light.
2. Creosote: } gradual diminution.
3. Eupione: } gradual diminution.
4. Sulphurous acid: complete cessation.

As a slight trace of many of the above-mentioned substances is sufficient to prevent the slow combustion of phosphorus, it is well to observe that the employment of this body in eudiometry requires great caution, and is, besides, very limited. Indeed, an accurate result could not be obtained in the analysis of a gaseous mixture, containing a trace of the substances indicated.

DESCRIPTION AND ANALYSIS OF A METEORIC MASS, FOUND IN TENNESSEE, AND COMPOSED OF METALLIC IRON, GRAPHITE, HYDROXIDE OF IRON, AND PYRITES.*

BY G. TROOST, M.D., TENNESSEE.

During my excursions through East Tennessee, I had seen small fragments of native iron, and had heard of large masses of it, which were believed to be silver. It being considered a precious metal, all that was known about it, and the place where it was found, were kept a profound secret. Some less prejudiced inhabitant at last became acquainted with the nature of the metal, and its real value was made known. To the politeness of Col. Micajah C. Rodgers of Serierille, I am indebted for a considerable quantity of it; and the Hon. Judge Jacob Peck of Jefferson County, has also presented me with some small fragments. I am thus enabled to lay a description of this singular substance before the scientific public.

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* From Silliman's *American Journal of Science and Arts*, April 1, 1840.

Having ascertained, as appears from the analysis below given, that this iron contains nickel, the mass must be considered of meteoric origin; but it differs from most of the masses of meteoric iron hitherto described. The original weight of it is said to have been about 2000 pounds. The portions that I have seen, (as well as those which are in my possession,) present a singular heterogeneous mixture of metallic iron, carburet of iron or graphite, sulphuret of iron, (pyrites,) and hydroxide of iron, the latter brown and yellow; in some parts all four ingredients form a kind of homogeneous mixture.

The most abundant constituent, however, is the nickeliferous iron, and it composes about $\frac{95}{100}$ths of the whole mass. It has partly a crystalline structure, and is in part composed of grains or globules of various sizes and forms, merely agglutinated together, or sometimes separated by a thin flexible highly polished pellicle of graphite. The crystalline part is composed of laminæ of various thickness, in the form of equilateral triangles, which are separated from each other by very thin flexible pellicles, as mentioned above respecting the grains.

I expected to find these triangular laminæ placed in such position as to form octahedrons; or showing a cleavage parallel to the sides of a regular octahedron; but this is not the case, as the cleavage gives a regular tetrahedron. I have one of these forms, which is about an inch from base to apex.

The metallic iron is also dispersed in small irregular-shaped masses through a hard, compact, brown hydrated oxide of iron. Throughout this the iron is also dispersed in invisible grains, to be detected only by the magnet, which attracts them when the substance has been reduced to powder.

This iron is malleable. I have in my possession a horse-shoe nail, which was made of it without having undergone a previous preparation, but it is harder and whiter than common wrought iron. This hardness and color may be owing to a small quantity of carbon which it contains, or perhaps to the nickel; in its natural state, however, the color of the iron differs much in different parts. In some it is black, and has no metallic lustre; in others, it has a brilliant metallic lustre, and is then always much whiter than steel or common iron. It is then but little susceptible of being tarnished when exposed to the action of the air; the black part being merely tarnished, may be rendered white by a file; in some places it is covered with a kind of black varnish.

The substance which constitutes the greatest part of the remainder of the mass, is graphite. This substance is not easily distinguished from the common graphite or plumbago, except that it is a little harder than the common granular and compact varieties, and is also rather blacker, and makes a finer, blacker, and more distinct line upon paper than common plumbago. When rubbed with a hard body it assumes a bright metallic lustre. It is not pure graphite, but rather a mixture of graphite and metallic iron. The iron can be partly removed by a magnet when the graphite is reduced to powder, but a considerable portion remains mixed with the graphite, which, when acted upon with hydrochloric acid, is dissolved with a brisk effervescence of hydrogen gas.

The sulphuret of iron, or pyrites, occupies the smallest portion of the mass. This pyrites is not attracted by the magnet, nor does it seem to act upon the magnetic needle. It can easily be cut with a knife, and is consequently softer than common pyrites. It does not give sparks when struck with steel, another property which distinguishes it from common pyrites. It is easily soluble in diluted hydrochloric acid, with a brisk evolution of sulphuretted hydrogen gas, leaving a mixed powder of white and black in the fluid. It has a more or less sub-lamellar structure, in which no regularity can be perceived, and a color between bronze yellow and copper red, often tarnished.

The hydroxide of iron, which forms part of this mass, is a heterogeneous mixture of the varieties of the ore generally known under the names of brown iron ore and yellow ochre, and resembles this terrestrial mineral. Its color is generally brownish black, passing into liver brown. The external surface of the mass is covered here and there with the yellow earthy variety (yellow ochre); how far this covering extended, I am not able to say, as the mass was too roughly handled before any part of it came into my possession. Its fracture resembles that of the common compact brown iron ore. The blackish brown variety is so very hard, that the best file is immediately dulled upon it, and leaves particles of the steel on the surface of the ore. Nevertheless, the whole is not of uniform hardness; a part, particularly the liver brown, being scratched by the file.

Some small cavities in it are lined with lamellar crystals, resembling those of white pyrites.

This hydroxide, which serves as a matrix of the metallic iron, is not, judging from my specimens, abundant in the interior of the mass, but the exterior of the mass is entirely made up of it. At some places it is about one inch thick, while at others it is no more than one quarter of an inch, showing here and there small points of the metallic iron piercing through it.

Such are the characters and appearances of this mass, of the date and circumstances of whose fall, nothing is known. It was accidentally discovered near Cosby's creek, in the southwestern part of Cocke County, East Tennessee, and as I mentioned above, was considered as silver ore. Indeed, there is yet a fragment of it in the hands of an inhabitant, who asks for it 1500 dollars—a sum, which would be some hundred dollars too much, if it were pure silver.

CHEMICAL CONSTITUENTS OF THE DIFFERENT PARTS.

1. *Metallic Iron.*—100 grains of the metallic iron were dissolved in diluted hydrochloric acid, leaving a residue of half a grain of a black powder, similar to that obtained from the graphite. This solution, being treated with nitric acid, to convert the protoxide into peroxide, was precipitated by pure ammonia. The precipitate being washed and ignited, gave 124 grains of peroxide, = 87 grains of iron. The ammoniacal solution gave 16 grains of protoxide of nickel, = 12 grains of metallic nickel, with a trace of cobalt; loss, half a grain.

Iron	87·0
Nickel	12·0
Carbon	0·5
Loss	0·5
	100·0

2. *Graphite.*—50 grains of the graphite being pulverized and freed by a magnet from intermixed iron, were acted upon with diluted hydrochloric acid. An effervescence took place, with expulsion of hydrogen gas, owing to metallic iron, which was so intimately mixed with the graphite, that it was not attracted by the magnet. After the effervescence ceased, it was heated in order to dissolve every thing that was soluble. The insoluble part was washed and dried; it was pure carbon, and weighed 46½ grains.

The hydrochloric solution being treated with nitric acid, to convert the protoxide of iron into peroxide, and precipitated by ammonia, gave peroxide of iron equal to three grains of metallic iron. The filtered solution was treated with pure potassa, and a hardly perceptible gray flocculent precipitate was obtained, so that this iron was free from nickel.

Carbon	46·5
Iron	3·0
Loss	0·5
	100·0

3. *Sulphuret of Iron.*—A small fragment of the pyrites was dissolved in diluted hydrochloric acid, under a brisk effervescence of sulphuretted hydrogen gas. Part of it was insoluble; this after being washed and dried, was exposed to heat, by which the sulphur was sublimed, leaving a black powder. The quantity used was too small to determine the proportion; it is composed of *sulphuret of iron and carbon.*

4. *Hydroxide of Iron.*—The hydroxide of iron lost about 17 per cent. by being heated, and had all the characters of a similar residue from brown ironstone or hæmatite.

This is not the only instance in which meteoric iron has been found in the State of Tennessee. A small mass of it was found in Dickson County; another, a few miles west of Canyfork in De Kalb County. The latter had a smooth glossy surface, and was of an oval shape, its longer diameter being from 10 to 12 inches.

It is said that several masses have been found about 20 miles east from the warm springs in Buncombe County, North Carolina. I went to the spot, during my last excursion in East Tennessee, but I could learn nothing with certainty concerning it, and did not see any of the metal.*

ANALYSIS OF LIMESTONES, ESPECIALLY THE MAGNESIAN KIND, AND A METHOD OF COMPLETELY SEPARATING LIME FROM MAGNESIA, WHEN BOTH ARE PRESENT IN LARGE QUANTITIES.

BY ROBERT E. ROGERS, M. D., AND MARTIN H. BOYE'.†

Carbonate of lime, associated with more or less carbonate of magnesia, forms the principal ingredient of limestones. In some varieties the latter substance appears only as a trace, while in others it amounts to nearly 50 per cent. of the mass. When the proportion of the carbonate of magnesia is very considerable, the rock is termed magnesian limestone, or dolomite, the latter name being mostly applied to the crystalline varieties. Variable quantities of other substances, as silica, alumina, and the oxides of iron and manganese, are generally associated to some extent with the above principal constituents.

The silica is usually either in the free state, in the form of small transparent grains of quartzose sand, sometimes impalpably minute, or in chemical combination with the alumina and iron, (clays, &c.)

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* One mass, at least, of meteoric iron has been found in this county, and an analysis of it was published by Prof. C. U. Shepard, in this Jour. vol. 36, p. 81.—Amer. Eds.

† From the *Journal of the Franklin Institute of the State of Pennsylvania.*

The extensive use made of limestones in the arts and agriculture, as mortars, cements, fluxes and manures, renders it a matter of great importance to procure a certain and expeditious process for their analysis, especially as there exists great diversity of opinion respecting the relative efficiency of the several constituents.

We proceed to describe a mode of analysing calcareous carbonates, which we have found both certain and expeditious in practice, and therefore, we conceive, preferable to the methods generally in use, which demand extreme care and considerable time to furnish accurate results. The method here proposed we have adopted with success in an extensive series of analyses performed for the geological survey of the state.

The limestone is first finely powdered, when a given weight, about thirty grains, is digested in chlorohydric acid in the ordinary way, evaporated to dryness, moistened with chlorohydric acid, and re-dissolved and filtered. The silica, and a large part of the other adventitious substances, are thus left upon the filter. They are then calcined and weighed, a correction being made for the weight of the ashes of the filter. These steps give the amount of the *insoluble matter*.

The filtered solution, containing besides the lime and magnesia portions of alumine and oxides of iron and manganese, is neutralized with ammonia, avoiding an excess, and then precipitated with sulphhydrate of ammonium, a small quantity of which will usually suffice. When the precipitate has subsided, it is filtered, the funnel being covered with a glass plate, so as to exclude the atmosphere, and then washed with water containing a few drops of the sulphhydrate of ammonium. The filter with its contents is then removed, pressed between bibulous paper, dried and calcined. The alumina, and oxides of iron and manganese, are thus obtained together. When their quantity is such as to require them to be separately estimated, it can be done in the ordinary way.

In determining the lime and magnesia, a fresh equal portion of the powdered mineral is employed, which is decomposed by a sufficient quantity of dilute sulphuric acid, with the aid of heat. Water is then added so as to fill the vessel up to a given mark, after which alcohol of known strength is introduced in such proportion as to make the whole solution contain 40 to 41 per cent., (estimated by volume) of alcohol. The alcoholic solution of this strength* precipitates entirely the *sulphate of lime* along with the insoluble matters. When the precipitate is settled, it is filtered under cover of a glass plate, and repeatedly washed with dilute alcohol of the same strength as that previously employed, until a barytic solution indicates no trace of sulphuric acid. The whole is now calcined, and the weight of the insoluble matters as already ascertained, being deducted, we obtain the amount of *sulphate of lime*, from which we compute that of the *carbonate*.

The filtered solution now contains the sulphate of magnesia, and an inconsiderable portion of the sulphates of alumina, iron and manganese, besides an excess of sulphuric acid. It is to be evaporated until all the alcohol is dispelled, and then precipitated by pure carbonate of potassa with the precautions usually prescribed. The magnesia, alumina and oxides of iron and manganese, thus precipitated, are filtered, washed and calcined. Subtracting from the weight of the whole that of the three latter previously ascertained, we find the amount of the magnesia, which is to be estimated as carbonate.

The separation of the lime in the form of sulphate from magnesia, by an alcoholic solution, is so complete as to make it unnecessary to estimate directly the magnesia, except when we desire to check one result by the other. The above process, it need hardly be said, will apply equally to the analysis of other substances than limestones, in which lime and magnesia abound, for we have only to precipitate these earths as carbonates, convert them into sulphates, and then treat them with dilute alcohol after the manner described.

We present the following analyses by way of illustration :—

1. A white crystalline dolomite, from the neighbourhood of Montville, New Jersey. *Specific gravity*—2·853.

A portion, 1·469 grammes, was raised to a dull red heat, and the water, which was received in a tube containing chloride of calcium, was found to weigh ·007 grm. or ·48 per cent. This small amount of water is not expelled at the temperature of boiling water.

Two other portions of the powdered mineral, treated after the method described, gave these results :—

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* Alcohol of this strength has a *specific gravity* of 0·951 to 0·949 at 60° Farh. and marks between 17° and 18° Baumé. Alcohol of the shops (alcohol rectificatus Lond. Phar.) marking 54½ Pennsylvania proof—has a specific gravity of 0·835. Five volumes of this, and 6 to 6½ volumes of water, will give a very suitable mixture for the above purpose of analysis.

Insoluble matter, . .	·04 per cent.
Alumina, ox. iron, and ox. manganese . . .	·15
Sulphate of lime, and insol. matter, . .	76·09
Magnesia, alumina, and ox. of iron and manganese,	20·70

By subtracting the insoluble matter ·04 from the joint weight of the insoluble matter and sulphate of lime 76·09, we get 76·05, and subtracting the alumina and oxides of iron and manganese from the joint weight of these and the magnesia, we have for the magnesia 20·55.

A reference to the annexed table, the use of which will be explained, shows that 76·05 per cent. of sulphate of lime is equivalent to 31·54 per cent. of lime, or to 56·11 per cent. of carbonate of lime.

It also appears that 20·55 per cent. of magnesia is equivalent to 42·54 of carbonate of magnesia. The result will therefore stand thus :—

Carbonate of lime	56·11
Carbonate of magnesia	42·54
Alumina and oxides of iron and manganese	0·15
Insoluble matter	0·04
Water	0·48
	99·32

Were we to estimate the magnesia in this case by the loss, it would be 43·22 carbonate of magn. equivalent to 20·88 magnesia, or 0·33 per cent. more than the amount found by direct estimation.

With a view further to show that the *whole* of the lime is procured by the above method, and therefore that we may safely estimate the magnesia, by subtracting the carbonate of lime and other ingredients directly got from the weight of the mass, we subjoin the following example of a specimen found to contain no magnesia.

2. A white crystalline, imperfectly saccharoidal limestone, from near the mouth of Yellow Breeches Creek, Susquehanna River, Pa.

From one portion of the powdered mineral, treated with chlorohydric acid, we obtained

Insoluble matter	2·3 per cent.
Alumina	1·2
Ox. of iron and manganese	*none*

Another portion treated with sulphuric acid, and diluted alcohol of the proper strength, gave

Insoluble matter and sulph. lime 133·19.

Subtracting the insoluble matter, 2·3, from the sulphate of lime and insoluble matter, we have sulphate of lime 130·89 per cent., which is equivalent, as the table will show, to 96·3 per cent. of carbonate of lime.

The amount of water as derived from a third portion was 0·2 per cent. Our analysis therefore stands thus :—

Composition in 100 parts—

Carbonate of lime....	96·3 per cent.
Carbonate of magnesia	*none*
Alumina............	1·2
Insoluble matter	2·3
Water..............	0·2
	100·0

*Table for calculating Lime and Carbonate of Lime from the Sulphate of Lime, and also for calculating the Carbonate of Magnesia from Magnesia or its Sulphate.**

		1	2	3	4	5	6	7	8	9
Sulphate of lime	Lime	0·41532	0·83064	1·24596	1·66128	2·07660	2·49102	2·90724	3·32256	3·73788
Sulphate of lime	Carbonate of lime	0·73780	1·47561	2·21341	2·95121	3·68902	4·42682	5·16462	5·90242	6·64023
Magnesia	Carbon. of magnesia	2·07002	4·14004	6·21906	8·28009	10·35011	12·42013	14·49015	16·56017	18·63019
Sulphate of magnesia	Magnesia	0·34015	0·68030	1·02045	1·36060	1·70075	2·04009	2·38105	2·72120	3·06135

The first vertical column of the table contains the names of the substances, from a known weight of which we wish to compute the weight of the substances embraced in the second column. The figures in the horizontal lines represent the quantities of the substances named in the second vertical column corresponding to those quantities of the substances in the first column, which are signified by the numbers at the head of each vertical division of the table. An example will render the mode of using the table sufficiently plain.

In the first analysis the amount of sulphate of lime was 76·05. To ascertain from the table the quantity of carbonate of lime equivalent to this amount of sulphate, we find on the horizontal line appropriated to the carbonate, the quantity due to seven parts of the sulphate—namely 5·16463, then the quantity due to six parts, namely 4·42682, and then that equivalent to five parts or 3·68902. By arranging these in their proper decimal order, so as to impart to the several amounts taken from the table, the value they are intended to have as units, tenths, hundredths, &c., and then performing a simple addition, we get the amount of carbonate corresponding to the whole quantity of the sulphate.

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* This table is taken partly from H. Rose's Analytical Chemistry, vol. ii., and partly calculated for the present purpose. The principle of this method of calculating analytical results was first set forth by Poggendorf in his Annals, vol. xxi., and has since been extensively carried out by H. Rose in his work just mentioned.

The figures will stand thus:—

Sulphate of lime 76·05

51·6462
4·42682
·000000
368902

Carbonate of lime 56·1099102

In the same manner, 20·55 of magnesia will be found to be equivalent to 42·54 of carbonate of magnesia, thus:—

Magnesia .... 20·55

41·400
00·000
1·035
·103

Carbonate of magnesia 42·538

As it may be sometimes convenient to evaporate the magnesian solution to dryness, ignite it, and from the sulphate of magnesia thus procured, compute the magnesia or its carbonate. We have introduced into the table a column to facilitate the calculations.

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ANALYSIS OF A CHROMIC IRON ORE, FIRST OBSERVED BY R. C. TAYLOR, ESQ., AT MAHOBAL, NEAR GIBARO, ISLAND OF CUBA.*

BY JAMES C. BOOTH AND M. CAREY LEA.

1. *Description.*—This mineral has a black color, and shining metallic lustre, closely resembling Franklinite from New Jersey. It is moderately brittle, exhibiting a chocolate brown streak, when reduced to the finest powder. The mass consists of coarsely crystalline particles, aggregated together, with intervening talcose matter, of a lighter color and softer texture than the chromic iron. This crystalline structure is so evident, that triangular faces of the octahedron are observable in a majority of the specimens.

2. Before the blowpipe it dissolves in a bead of borax or microcosmic salt, exhibiting the characteristic reaction of oxide of chrome.

3. *Analysis.*—To obtain a proper specimen of the mineral for analysis, it was coarsely broken up and separated from the gangue, as far as practicable. It was then finely pulverized, and one gramme of it ignited with carbonate of soda and caustic potassa, in order to convert the oxide of chrome into chromate of potassa.

4. The fused mass was digested with water and thrown upon a filter, which separated the oxide of iron and that portion of the mineral which had not been decomposed, from the other constituent which passed through in solution. The filter was then treated with hydrochloric acid, which dissolved the iron, leaving the undecomposed ore on the filter. This was found to amount to ·353.

5. The solution of chloride of iron which passed through, was then digested with nitric acid, and the peroxide precipitated by ammonia. This amounted to ·172. In a previous experiment, it was found to contain neither alumina nor magnesia.

6. The solution obtained by the first filtration (4), was next neutralized by nitric acid, enough being added to precipitate and redissolve the alumina. The latter was then precipitated by bicarbonate of soda, and its weight found to be ·1414.

7. The remaining solution was now evaporated to dryness with carbonate of soda, and treated with water. The magnesia thus rendered insoluble, was separated and amounted to ·090.

8. In the solution from (7), there still remained the oxide of chrome, which was estimated by concentrating the liquid by evaporation, and adding to it, while boiling, hydrochloric acid and alcohol. The chromic acid, thus converted into oxide of chrome, was precipitated by ammonia and separated on a filter. The solution passing through, still contained a small portion of oxide of chrome, and was therefore evaporated to dryness and digested with water. The oxide of chrome thus rendered insoluble, was added to that before obtained, and the weight of the whole amounted to ·244.

9. *Conclusions.*—The streak of the mineral being chocolate brown, it is difficult to say whether this color arises from the protoxide of iron or the brown oxide of chrome, a problem of exceedingly difficult solution by chemical analysis. Supposing the iron, however, to be in a state of protoxide, the ·172 will be reduced to ·1544 of protoxide. Now if ignition with carbonate of soda and caustic potassa, left a portion of the mineral

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* From Silliman's *American Journal of Science and Arts*, April, 1840.

undecomposed, it may without great error be assumed that the iron in this portion has not been peroxidized by that operation, and that therefore ·353 is the correct weight of the undecomposed portion of the mineral. By adding the several weights obtained, we have,

Oxide of chrome	·2440
Protoxide of iron	·1544
Alumina	·1414
Magnesia	·0900
Undecomposed ore	·3530
	·9828

This shows a loss of 1·72 per cent., which may be ascribed in part to errors in analysis, and partly, without impropriety, to a partial peroxidation either of the iron or chrome.

By omitting the undecomposed matter, and calculating the per centage of each ingredient, we find the mineral to consist of

Oxide of chrome	38·742
Protoxide of iron	24·516
Alumina	22·452
Magnesia	14·290
	100·000

This result indicates that a portion of the talcose matter was included in the specimen, notwithstanding the care exercised in its separation. Viewing the alumina, with a little silica included in it and the magnesia, as belonging to the talc, we find the formula for the oxides of chrome and iron to be 2 : 3, or $3(FeO)+2(Cr^2 O^3)$. The formula generally received for the pure mineral is $2Cr+Fe$, and leads to the supposition that in the present case a portion of the iron exists as peroxide, a view which is strengthened by the brown streak of the mineral.

ANALYSES OF ANTHRACITE AND IRON ORE.

BY PROFESSOR JOHNSON.

In the *Journal of the Franklin Institute*, November, 1839, is a valuable paper by Prof. Walter R. Johnson, Prof. Chem. and Nat. Phil. Med. Dept. Penn. Coll., entitled "Analysis of some of the Anthracites and Iron Ores found on the head waters of Beaver Creek, in the counties of Luzerne, Northampton and Schuylkill, Pa." This paper contains an account of the geological arrangement of the coal fields lying near the head waters of the Beaver Creek, explored by Prof. J. in the summer of 1838, from which the specimens analyzed were obtained. From the cutting made for the railroad leading to the mines of the Beaver Meadow Coal Company, it is evident that there is more than one flexure in the Beaver Meadow Coal Trough. "In this cutting there is displayed a nearly vertical bed of coal, more than 30 feet in thickness; having, however, a real position or dip of S. 10° E. 85°, and consequently a course or *strike* N. 80° E." To the geological account succeed the descriptions and analyses of various specimens of anthracite.

No. 1. Sp. grav. 1·613. Water, 3·43; gaseous matter volatile at bright red heat, 4·08; carbon not volatile by simple heat, 87·48; earthy matter, 5·01=100.

No. 2. Sp. grav. 1·594. Water, 3·26; other matter volatile at red heat, 1·05; carbon, 91·69; earthy matter, 4=100. Analysis of the ashes of No. 1 and 2, gave, on an average, silica, 52·375; alumina, 36·745; peroxide of iron, 8·125; lime, 1·550; magnesia, 1·275.

No. 3. Sp. grav. 1·630. Volatile matter, 9·6; carbon not volatilizable by simple heat, 85·337; earthy matter, 5·063=100. The combustible gas given out in the distillation of this coal is of considerable amount, and indicates it as a fuel well adapted for use under steam boilers.

No. 4. Sp. grav. 1·560. Water and combustible gases, 6·89; carbon not volatile by simple heat, 91·64; earthy residuum, 1·47 =100.

Prof. J. remarks: "In comparing the results in the above analyses with those of other experiments on anthracite, I find the average amount of carbon much greater than has heretofore been assigned to that species of fuel. Thus, of twelve species of anthracite analyzed by Berthier, the mean per-centage of carbon was 79·15; ashes, 13·25; volatile matter, 7·37."

No. 5. Sp. grav. 1·6127. Combustible carbonic oxide and a little carburetted hydrogen expelled at red heat, 3·55; carbon not volatilizable by simple heat, 86·06; earthy matter, 3·71=100.

No. 6. Sp. grav. 1·559. Water, ·390; gaseous matter, including some azote, volatile at bright red heat, 5·515; carbon, not volatilizable by heat, 91·016; earthy matter and oxides, 3·079=100.

Iron Ores.—The bed of iron ore from which were taken the samples examined by Prof. Johnson, is found on the southern declivity of the bluff, about forty rods northerly from the south fork of Beaver Creek. The thickness of the bed of ore and shale is seven feet, and it lies seventeen feet beneath the surface of the ground at the point where it is opened. The *first* variety analyzed gave by the usual assay in the dry way, the following results:

Water, expelled at 250°	0·4
Carbonic acid	26·6
Cast iron	33·8
Earthy matter	26·64
Oxygen	12·55
	99·99

The ore has a light bluish ash color, is moderately tough before calcination, and has a spec. grav. of 3·247. The pig metal given in the assay is soft, tough, and of a dark gray color. The cinder is a transparent, nearly colorless glass, very fusible, and contains few adhering particles of metal. The use of pure carbonate of lime as a flux in the proportion of one part of this metal to six parts of raw mine, will produce a complete reduction of the ore and fusion of the earthy ingredients. Assayed in the humid way, this ore yields the following results:

Water	0·40
Carbonate of iron	63·20
" of lime	2·50
" of magnesia	2·27
Oxide of manganese (?)	2·00
Silica	17·50
Alumina	10·55
	98·42

The above quantity of carbonate corresponds to 39·1 per cent. of protoxide or 30·45 per cent. of pure metallic iron, which is 3·35 per cent. below the above yield in *pig metal*, or it is 9·9 per cent. of the pig metal itself, to be regarded as pure iron matter; which is probably very near the true average amount, according to the latest and best analyses. The yield in *iron* is equal to the average of Scotch ores in the neighbourhood of Glasgow.

The *second* variety of the ore examined, was a sample from the same locality, but from a different part of the bed from that in which the preceding was found. Sp. grav. 2·896. Assayed in the dry way it gave—

Water	13·12
Pig metal	44·96
Earthy matter	24·804
Oxygen	17·11

The ore seemed to have suffered a change by atmospheric influences, from the condition of a carbonate of the protoxide of iron to that of a hydrate of the peroxide; in which process some of the earthy ingredients may have washed away. Analyzed in the *humid* way, it gave—

Water	13·12
Peroxide of iron, with a trace of manganese	63·65
Silica	13·45
Alumina	8·77
Magnesia	1·01
	100·00

The quantity of peroxide of iron corresponds to 44·55 per cent. of iron, or ·41 per cent. less than that of the metal actually obtained. Hence it appears that the quantity of iron remaining in the cinder, is very nearly equal to that of the carbon, &c., in the pig metal.

Near the second bed of coal opened on the slope of the hill north of the northern branch of Beaver Creek, Prof. J. found some ore thrown out in excavating a coal shaft. It is of a brown or yellowish brown color, compact, with small shining particles. Sp. grav. 3·555.

At a temp. of 330° it loses in moisture	0·550
By strong calcination, it loses of water	10·048
It contains of peroxide of iron	71·120
It contains of earthy impurities	13·382
	100·

The quantity of pig metal obtained in Prof. Johnson's analysis was 49·77 per cent.; its color dark gray; structure crystalline, granular. It was soft, tough, and well adapted for foundry purposes. The cinder was a perfect glass, translucent on the edges, of a smoky color, readily fusible before the blow-pipe, and consequently it presents no obstacle to the free running of iron in a furnace. This ore being in the immediate vicinity of the richest of the coals above described, will be a highly valuable resource, if it shall be found in beds of such thickness, and with such accompaniments as to render its attainment not too expensive.

ON THE FORMATION OF NITRITES IN THE DIRECT WAY.*

BY M. J. FRITZCHE.

Nitrous acid is disengaged by pouring nitric acid on starch, and this gaseous acid is directed into a thin pap, made with finely levigated oxide of lead. The latter is quickly transformed into a white mass, which, by continuing the disengagement of gas, is completely dissolved in the liquor. The deep yellow solution which is thus obtained, evaporated at a gentle heat, gives a very considerable quantity of nitrite of lead in yellow silky scales. Only a very small quantity of nitrate of lead is formed during this operation; there is no doubt that nitrous acid may be directly combined with bases.

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* *Imperial Academy of Sciences of St. Petersburgh;* Sitting of August 23, 1840.

ON PEPSINE, THE DIGESTIVE PRINCIPLE.*

BY M. WASMANN.

In a very long memoir, M. Schwann has shown that the gastric juice contains a peculiar principle which he called *Pepsine*, but he had not succeeded in obtaining it in a state of purity. M. Wasmann has been able to isolate this principle, which, he says, resides in the grumous matter that fills the internal cell of the glandular membrane of the stomach.

Mr. W. prepared pepsine in the following manner:—he separated the glandular membrane from the stomach, without cutting it; he washed it and digested it in distilled water at a temperature of from 30 to 35°; at the end of a few hours, he decanted the liquid, and again washed the membrane in cold water, until it had a putrid odour. He filtered the combined liquids, and thus he obtained a transparent liquid, rather viscous and endowed with an eminent digestive power, when a little hydrochloric acid was added. In order to separate from it pepsine in the pure state, acetate of lead was added to it; the precipitate was washed and decomposed by a stream of sulphuretted hydrogen. The liquor separated from the new precipitate is fluid, colorless, and acid.

When, after having evaporated this liquor to a syrupy consistence, without raising the temperature above 35°, absolute alcohol is poured into it, an abundant flaky precipitate is produced in it, which, carefully dried, is presented under the form of a yellow gummy matter, which does not attract moisture;—this is M. Wasmann's pure pepsine.

This substance is soluble in water, which it renders acid, because it obstinately retains a certain quantity of acetic acid. The solution, even though it contains only $\frac{1}{50000}$ of pepsine, dissolves, in from six to eight hours, slightly acidulated white of eggs; but it loses its digestive power when boiled, or when it is saturated by potassa. In the latter case, it deposits flakes which are insoluble in water, and which slowly dissolve in dilute acids, forming liquors of little power.

Pepsine is recognised in the precipitates determined in its solution by the dilute acids—which precipitates are redissolved in an excess of those acids. It is distinguished from albumen by the precipitates which acetic and hydrochloric acids occasion in its aqueous solution; and from caseum, because ferrocyanuret of potassium does not precipitate its acid solutions.

The concentrated aqueous solution of pepsine is rendered turbid by bi-chloride of mercury and acetate of lead, which form precipitates soluble in the precipitating reagent, and in acetic and hydrochloric acids. Sulphates of protoxide and deutoxide of iron, and chloride of tin, likewise precipitate pepsine, and all the precipitates formed by these metallic solutions possess digestive properties.

In burning, pepsine gives out the odour of burnt horn, and leaves a carbon difficult to incinerate, in which lime, soda, phosphoric acid, and a little iron, have been found.

ON ALIZARINE, THE COLORING MATTER OF MADDER, AND ITS EXTRACTION, &c.†

The late learned M. Robiquet, in concert with M. Colin, professor of Chemistry, gave the name of *alizarine* to one of the principles of madder: it occurs under a crystalline form, of an orange-red color.

This chemist proposed carbonising the products contained in madder by sulphuric acid, and thus to isolate the *alizarine* which is not destroyed by this carbonisation; but this not giving always identical products, M. Alphonse Meillet has just published a process by which the different madders of commerce may be tested, and the alizarine obtained at a price that will enable manufacturers to prepare it and use it in dyeing. This process is as follows:—

Ten kilogrammes of powdered madder are put into water containing in solution two kilogrammes of alum for every twenty quarts; effecting this solution at a temperature of 60° C., the whole is slowly carried to boiling, and is kept in a state of ebullition for twenty-five or thirty minutes, the decoction of madder is strained through cloths into alum water, and the residue is strongly pressed; this operation being repeated three times, is sufficient to exhaust it; the liquors are then mixed, it is left to settle for some time, and before it is completely cold, after being decanted, 625 grammes of sulphuric acid at 66°, diluted with twice its weight of water, should be poured into it, stirring all the time. Thick reddish flakes are then precipitated, immediately going to the bottom of the liquor, which, from purple red, becomes greenish yellow. The supernatant liquor is then removed, and replaced by clean water; the remainder is then filtered; it is washed several times and a purple mass is obtained, which, when dried in the open air, is presented under the form of shining brown red scales. In this state, alizarine is not perfectly pure; it retains traces of sulphuric acid, xanthine, and purpurine. To deprive it entirely of these substances, the precipitate, while damp, must be heated with 6 parts of carbonate of potassa, dissolved in from 12 to 15 parts of water, to 4 of alizarine; the carbonate is afterwards saturated with sulphuric acid; a precipitate of a fine red color is then obtained; this is pure alizarine: it is dried, pulverised, and carefully washed on the filter: it is then presented in the form of an orange-red powder. The madders of Avignon have always given, by this process, 2, 2½, and sometimes 3 per cent. of alizarine.

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* Extracted from the *Revue Scientifique et Industrielle.*

† *Journal des Connaissances Necessaires et Indispensables*, July, 1840.

ON GRANATINE.*

BY M. LANDERER.

M. L. obtained this substance by treating several times with alcohol the bark of the unripe fruit of the pomegranate. The alcoholic extract thus obtained was bitter and very astringent. He dissolved it in water, and added albumen, to separate the tannin from it; he afterwards filtered the liquor, evaporated it, and treated it with dilute sulphuric acid. This solution was very bitter; caustic alkalies formed in it an abundant precipitate. This precipitate was dried; part of it was dissolved in dilute hydrochloric acid, and the remainder in alcohol. From the latter solution are obtained crystals partly of a stellated form, as well as a pappy mass, in the proportion of five grains for five pomegranates.

This substance, heated in a platinum crucible, burned with the odour of burnt bread; it dissolved in all the dilute acids. With nitric acid the small stellated crystals were turned of a blood-red colour, giving rise to a substance of the nature of wax.

We do not find sufficient details for characterising this substance and assigning to it the place which it ought to occupy.

ON THE COMBINATION OF CERTAIN SALTS OF NICKEL WITH AMMONIA.

BY M. J. FRITZCHE.

Every one knows that the salts of nickel form blue solutions with ammonia, but hitherto these combinations had been obtained only in solution. However, they may easily be procured crystallized, and the author describes three of them in this note. The first is a neutral ammoniacal chloride of nickel in regular octohedra, the second an ammoniacal nitrate of nickel, of a fine blue color, also in octohedra, and the third an ammoniacal sulphate of nickel, in irregular crystals. All these bodies contain oxide of nickel and the acids in the proportions of neutral salts, and are composed like the sulphates of the analogous salts of copper.

COMPOUNDS OF CREOSOTE.‡

BY M. LAURENT.

M. Auguste Laurent presented to the Royal Academy of Sciences, Paris, at its sitting of the 20th of July, the summary of a work which he has just completed, on the new series of compounds of which creosote seems to be the radical. Its formula may be expressed by $C^{24} H^{10} O + H^2 O$. With chlorine it gives chlorophenesic acid, whose composition is represented by $C^{24} H^4 Cl^6 O + H^2 O$. Bromine converts creosote into bromophenesic acid, whose formula is $C^{24} H^4 B^6 O + H^2 O$. Creosote and sulphuric acid give a sulphophenic acid analogous to sulphovinic acid. With nitric acid, three crystallized acids are obtained, some of whose salts detonate with great violence.

In addition to the above, M. Pelouze made known a fact which was not mentioned in M. Laurent's memoir, and which the latter begged him to communicate to the Academy. This was, that if creosote$= C^{24} H^6 O + H^4 + H^2 O$, be treated by nitric acid, two new acids are obtained which easily crystallize and produce salts that detonate loudly. The first, nitrophenasic acid, has this composition: $C^{24} H^6 O + O^2 + Aq + 2\, Az^2 O^3$. The formula of the second, nitrophenesic acid, is $C^{24} H^6 O + O^2 + Aq + 3\, Az^2 O^3$.

ON AN EASY METHOD OF PREPARING CHROMIC ACID, AND ON THE MANNER IN WHICH IT ACTS WITH SULPHURIC ACID.§

BY M. J. FRITZCHE.

M. F. cautiously pours concentrated sulphuric acid into a hot and concentrated solution of bi-chromate of potassa, and obtains a bulky, crystalline, crimson precipitate, which he separates and dries by heat, and afterwards *in vacuo*. This is chromic acid, which is washed to remove any supernatant liquor and sulphuric acid that may yet adhere to it. As to the combination of sulphuric and chromic acids, which M. Gay Lussac described in the *Annales de Chimie et de Physique*, t. xvi. p. 102., the author has never been able to obtain it, and he is much disposed to doubt its existence.

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* *Journal de Chimie Médicale*, August, 1840.

† *Imperial Academy of Sciences at St. Petersburg*; Sitting of November 22, 1839.

‡ From *L'Institut*, No. 343, July 20th, 1840.

§ *Imperial Academy of Sciences of St. Petersburgh*; Sitting of August 23, 1840.

[We have long been acquainted with this method of obtaining chromic acid, which M. Fritzche has here given as new. Eds. Chem.]

ANIMAL HEAT.*

Dutrochet has found that the temperature of the frog in the open air is 1° C. lower than that of the surrounding atmosphere; but that when immersed in water, its temperature is 0·3 to 0·5 C. higher than the surrounding air. The temperature of the grey lizard was 0·18° lower than that of the atmosphere. The temperature of the carp when plunged in water is the same as that of the liquid. The leech and snails are colder than the atmosphere.

ORIGIN OF THE MINERAL DYSODIL.†

In 1808 Sordier classed this mineral among bituminous substances. It is well known in Sicily, where it is employed as a combustible substance.

Ehrenberg, in a paper published last year, demonstrates that this substance, which resembles yellow wax, is formed of the siliceous debris of naviculæ, cemented together by a kind of resin. He shows also that it exists in the collection of Krantz of Berlin, in a lignite of Westerwalde, the colour of which is black, and in which all the microscopic characters of the yellow dysodil of Sicily may be recognized, but with some difficulty, because it is mixed with a considerable quantity of the pollen of pines and other vegetable remnants. Ehrenberg has since found it also in the bituminous foliated coal of Geistinger Busch, near Rott and Siegburg, and also in the foliated lignite of Vogelsberge. He concludes that dysodil is produced by the agglomeration of infusoria, and is obviously a polishing slate, accidentally infiltrated with mineral tar; whilst at Bilin, near Cassel, it is found existing without any mixture of bitumen. Its colour may be yellow or brown or black: it occurs generally in extensive beds, and in sufficient quantity to be used for economical purposes.

PELOSINE.‡

This substance has lately been extracted by Wiggers from the root of the *Cissampelos Pareira (Pareira brava)*,—a drug which has lately been introduced into the English pharmacopœia. The root is to be cut into small portions and boiled with water acidulated with sulphuric acid, three or four times successively; the decoction is then to be precipitated with carbonate of soda; the brownish grey precipitate is to be washed, dried, and boiled again with acidulated water; the solution treated with animal charcoal, filtered and precipitated with carbonate of soda; the yellow resulting precipitate is to be washed, dried, and treated with ether. This affords pure *pelosine*. It is colourless; when water is added to the solution in ether, a yellow translucid substance is precipitated, which is *pelosine*—free from water. It is uncrystallizable, without smell, sweetish bitter. It is a powerful base, forming salts with sulphuric muriatic, nitric, acetic, oxalic and tartaric acids, but none of the products crystallize.

CHEMICAL ERRORS.§

Professor Erdmann has demonstrated that the statements of Dr. Golding Bird and Mr. Brett respecting the presence of titanic acid in Hessian crucibles are incorrect, and that they had mistaken impure silica for that substance. M. Marchand has also refuted the experiments of Dr. G. O. Rees, who affirmed that he had detected titanic acid in the blood, mistaking silica for that acid. The form of silica, which deceived these gentlemen, is familiar to practical chemists.

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[*] From *The Athenæum*, Aug. 15.
[†] Ibid.
[‡] From *The Athenæum*, Aug. 15.
[§] Ibid.

II. CHEMICAL MANUFACTURES.

GENERAL CONSIDERATIONS ON THE APPLICATION OF THE PHYSICO-CHEMICAL SCIENCES TO THE NATURAL SCIENCES, TO THE ARTS AND TO MANUFACTURES.*

BY M. BECQUEREL.

In the rapid whirl which, at the present period, bears along the mental powers—in the midst of our most sober daily concerns—every one wishes to be initiated into the mysteries of natural philosophy, and is eager for discoveries in physics and in chemistry, especially when they promise useful applications to the arts and manufactures. It is to discoveries of this nature that I wish to call your attention: happy if I am enabled to demonstrate to you that the numerous investigations which have given rise to them, may sometimes contribute to the public good: but, before explaining them, permit me to offer a few remarks concerning experiments in general.

Without the art of experimenting, physics, and chemistry, whose alliance has been productive of such great results, could not exist: but since it has been brought to perfection, nothing has been able to arrest their progress: however, to render the study of physics popular, it must be presented free from every obstacle.

When a young man sees, for the first time, the instruments used in the study of physics, the finish of whose ornaments frequently contends with their precision, he should ask himself whether this science may not be cultivated, with the hope of extending its limits, without having at his disposal the means of acquiring similar instruments. This single idea, if he has no other guide than himself, would be sufficient to deter him from devoting himself to a study, for which, before seeing a physical cabinet, he felt a decided inclination. But if he consult the works of the philosophers who have studied, fathomed, and analysed natural phenomena, from Galileo to the present time, he will be convinced that the greatest discoveries, with the exception, however, of those which require very accurate measures, have most frequently been made with instruments formed of the first objects which could be procured, and which are always at the disposal of him who knows how to investigate nature. Among a thousand instances I may mention the following:—

Galileo, at the age of eighteen, discovered the isochronism of the oscillations of the pendulum, by observing the periodical and regular motion of a lamp suspended from the roof of the church of Pisa, his native place.

Torricelli discovered the pressure of the atmosphere by means of a glass tube closed at one end, filled with mercury, and reversed in a bath of that metal.

Franklin, in order to establish the identity of lightning with electricity, sent up a kite into the atmosphere.

Volta constructed the most admirable instrument which the physical and chemical sciences possess, with discs of silver, and little round pieces of damp cloth disposed in columns.

Haüy, by the aid of a knife and a kind of coarse compass, was enabled to find the crystalline system of every mineral substance, and consequently its molecular constitution.

Finally, do we apply physics to the study of natural phenomena? Nature herself becomes the laboratory, and we have, as instruments, the various objects profusely diffused over the surface of the globe. By simplifying the means of investigation, the study of physics is rendered less difficult; time is saved, and thus, life is doubled.

In the explanation of works, the same simplicity should be kept up; for history teaches us that the scientific career of a man frequently is reduced to a few general facts. Detailed works, executed to arrive at these facts, remain laid aside in scientific repertories, and may be compared to scaffoldings erected in order to raise a building, which, the edifice once finished, are pulled down. Hence it is that the scientific life of a man may be summed up in a few words; but these few words express eternal truths, imperishable monuments of the genius which discovered them. Thus, Kepler is known by his three famous laws, the fruit of more than twenty years' labor, and which, in immortalizing him, served Newton as data to find the laws of gravitation, whose action extends all over the universe. It is thus, also, that Newton himself shines forth with brilliant lustre, as having discovered the composition of light, and the laws depending on it; and Volta, as having constructed the pile; that Œrsted acquired great renown by having discovered the action exercised on a magnetic needle by an electric current, and Malus, for the discovery of the polarization of light, by means of reflection.

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* A lecture delivered to the Royal Academy of Sciences, Paris, at its sitting of the 13th of July, 1840.

In order to obtain such great results, which may be expressed in few words, experiments must often be multiplied *ad infinitum*, and a host of detailed facts must be taken into consideration which pass unnoticed in the world.

Such are the general principles which should direct the philosopher in his tedious investigations. I now arrive at less general questions.

Every branch of physics has had its phases of glory, its times of repose, and its recrudescences, which, by turns, have extended its limits. Since nearly half a century, electricity has made rapid progress, and one cannot tell where its discoveries will stop, which are all stamped with the illustrious name of Volta.

In Europe, and, I may even say, in all parts of the world, there is an emulation among all philosophers to extend its dominion, which cannot fail to produce the most beneficial results, as will be seen from the sketch which I am going to offer of the discoveries made within the last few years.

All bodies in nature are formed of homogeneous, or heterogeneous particles, kept at greater or less distances, by the action of forces, the agents of which are found in the spaces which separate them: these forces are, in unorganized bodies, heat, electricity, affinity, and cohesion; and, in organised bodies, those which preside over the phenomena of life, and whose principle escapes all investigation. It is, therefore, in these intermolecular spaces that the most mysterious, and I may add, the most sublime phenomena of nature, are operated. If the particles lose their natural position of equilibrium by any cause whatever, there results a host of physical and chemical effects. To study the molecular constitution of bodies, with respect to the forces which govern this constitution, these forces are taken, separated, and put successively in the presence of the material particles, in order to determine the mode of action of each them, and their mutual relation. It is then recognised, that if electricity be not the first cause of heat and affinities, it is, at least, indispensable to their production, each of these forces being unable to exist without it.

Experiments based on the velocity of electricity—a velocity of 90,000 leagues per second, and greater than that of light—tend to prove that the quantity of electricity associated with the particles of bodies is so enormous, that the imagination is startled at it. The elements of a simple particle of water appear to contain, according to the calculations of a celebrated natural philosopher, 800,000 charges of an electric battery composed of eight equal troughs, of two decimetres in height and six in circumference, and obtained with thirty turns of a powerful electric machine. If the quantity of electricity which is accumulated in the elements of a single particle of water were suddenly to become free, the most terrific detonations would be heard, which would shatter this edifice* to atoms. In fact this power, compared with which steam is nothing, whether it be considered as a very subtile matter, or as the result of a vibratory motion of the air, is uniformly employed by nature in maintaining the combinations and molecular constitution of bodies. The efforts of natural philosophers, therefore, ought to tend—as indeed they do daily tend—to withdraw this force from the bodies which contain it, in order to apply to the sciences and arts. As yet we have been able to liberate only a very small portion, which, nevertheless, produces chemical, calorific, or mechanical actions of great intensity. What, then, will it be when we are completely masters of it?

This force is liberated in all chemical actions, even the weakest, as heat in combustion and in all molecular phenomena; but, as heat is rendered available in chemical operations, so also should we turn to account the electricity disengaged, in order to provoke affinities where they are not manifested, to give them, when required, new energy, to transport bodies into different media, and to produce calorific effects even superior to those which we are able to obtain with our furnaces. Such should be the object of electro-chemistry. As an application of the calorific effects of this power, I may mention the following example:—

A platinum wire, communicating with the two extremities of a voltaic apparatus with an uniform current, becomes incandescent for some portion of its length. If this part be spirally twisted, all the heat is then concentrated in the interior of the circumvolutions. If small crucibles, with thin sides, made of a refractory earth, be placed on it, the greatest imaginable effects of fusion are produced, since the platinum itself may be fused: the eye can scarcely support the light given out: assays of gold or silver ores of several decigrammes are effected in two or three minutes, to liquefaction and cupellation; the combustion of the diamond is operated in a few instants. This is not all; even this helix may be put under an exhausted bell-receiver, into which may be introduced all the gases with which we mean to operate, so as to fulfil conditions which the chemist has not always the possibility of combining.

The thermo-electrical instruments some years ago employed to determine the interior temperature of the body of man and of animals, have again been used for the same kind of investigation, and particularly for studying the instantaneous calorific changes which the organs experience in various pathological cases, or under determined physiological circumstances, and which cannot be appreciated by ordinary thermometers: they have also served for ascertaining that vegetables have a heat of their own, although very different from that of the ambient media; that this heat is inappreciable during the night on account of the sleep of plants, and that it again shows itself under the influence of light, whilst the heat of the buds and flowers remains during the night.

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* The *Academie Royale des Sciences*, Paris.

The electrical forces, acting chemically, furnish us with the means of studying the influencé of masses in the phenomena depending on affinities (a subject which greatly occupied philosophers at the commencement of this century), and to measure these affinities under various circumstances.

In a combination of two atoms, the two atoms are united to one another by virtue of a force called *affinity*, whose nature is unknown to us, and which varies in intensity according to temperature and various physical causes. Now, if, with an exceedingly delicate instrument, we could lay hold of each of these atoms, and pull them in a direction contrary to their reciprocal attraction, the force employed to conquer the effect of this attraction might serve as a measure of it. Instead of this ideal apparatus, we have, in electric currents, a power capable of fulfilling the same functions. From the facts observed, it results that when two salts of the same acid are dissolved in water, we have an accurate means of determining the relation between the affinity of the acid for each of the two bases, and of following, step by step, the variations which this relation undergoes as that of the saline bases changes. The law of masses which fetters all these relations allows two metals, or any two substances in solution, to be separated from one another, without recourse being had to the ordinary chemical means.

There are few phenomena in the production of which electricity does not participate: phosphorescence is of this number. Recent observations on the property which certain bodies possess of becoming luminous in the dark, under the influence of various causes, reveal to us in the light, particularly in the electrical light, a new faculty. It is known that the solar spectrum resulting from the decomposition of light by the prism is composed of various parts which possess, some the calorific, others the chemical, faculty. It is also known that light renders various bodies phosphorescent, which have been exposed to its action for a few instants, and that all parts of the spectrum do not possess this faculty in the same degree. The observations in question show that different substances, such as glass, gypsum, &c., which allow of the passage of light entirely, or without sensible diminution, may partially or even totally remove from it the power of rendering bodies phosphorescent. Thus, this power is perfectly distinct from that which a focus of light possesses of lighting or heating bodies; light probably has yet many other properties which may one day be discovered!

Such now is the delicacy of our instruments, that we can study the chemical changes of light in circumstances under which formerly they could be recognized.

Works on the application of electro-chemical force to the metallurgy of silver, copper and lead, without the intervention of mercury, employing but little fuel, or even none at all in many cases, the general principles of which I acquainted you with in a former lecture, (for which see *The Chemist*, No. VI. page 164), have been successfully continued on considerable quantities of ore procured from different parts of Europe, Asia and America. The researches have been carried on—1st, in the immediate separation of metals from each other, particularly of silver from lead, in galena; an operation so rapid that two kilogrammes of silver may be extracted, in the metallic state, from a silver ore, properly so called: 2ndly, in the preparation to which the ore is subjected, in order to dispose of each metal to be removed by the electric current,—a preparation which, varying according to the nature of the ore, does not present any difficulty when the silver exists in it in the metallic state, or as a sulphuret, as is most frequently the case with that from Peru and Mexico, whilst it is more complicated when the silver is in combination with other substances, the employment of small quantities of fuel then becoming indispensable for effecting roasting at a low temperature.

In those rich countries it frequently occurs that the ores are abandoned, either for want of the fuel required for smelting them, or preparing them for amalgamation, or on account of the distance from the sea, at which they are found, which is unfavourable to their removal to Europe, where they might advantageously be treated.

In Columbia, where considerable quantities of very zinciferous gold and silver ores are found, the richest are sometimes exported to Europe to be smelted, whilst the poorest, and those of an average quality are abandoned, or treated with so little advantage that the companies are losers by it. They are now endeavouring to introduce new means of preparation which apply as well to amalgamation as to the electro-chemical process: we are therefore led to think that this process will very soon be put in practice, if not entirely, at least to a great extent, in those countries of both divisions of America, which possess the requisites,—abundance of sea-salt, and, in some cases, a little fuel.

The silver ores, which most resist amalgamation, and other modes of treatment, are those which contain much copper or arsenic. The quantity of these ores is very considerable, particularly in Chili, which the inhabitants offer to the Europeans, who sometimes, for want of freight, take them as ballast, without being certain of deriving any advantage from them, in consequence of their ignorance of their contents and of the mode of treating them. Sometimes also it happens (and that has very recently been seen) that the Europeans get ores whose richness in silver and copper is insufficient to defray the expense of freight and treatment. It is therefore necessary to separate from these ores, in Europe, and at small cost, the silver, copper, and arsenic. This problem has just been solved in a very satisfactory manner, presenting advantages to speculators who are more enlightened than their predecessors.

In studying the cause of the working of these mines in America being given up, it will be found that it must be attributed, not only to the difficulty of heating certain ores, but also to the price of mercury, which is so high, that, in Mexico and Peru, small works have been constrained to stop; and, moreover, to the difficulty of getting rid of the water which inundates the mines. The latter obstacle often causes considerable injury to the European companies established in the New World. These inconveniences, serious as they may be, are not insurmountable: to conquer them, stability is required in the social state of each country, and that the arts and sciences encouraged in them should be universally diffused.

It is not the same in Asia, in the Russian possessions, where great mineral riches exist, from which great profits are daily being derived, owing to the gradual and judicious introduction of improvements made in Europe in the treatment of the precious metals, from which immense advantages will accrue to the Russian empire.

In the silver mines of Altaïa, which belong to the emperor, and whose produce is very considerable, the working is directed with method and economy. The expenses of extraction, of treatment and management do not amount to more than a fourth of the rough product, notwithstanding that the ores are generally very poor. These advantages are owing to the very low price of hand labor, to the abundance of fuel and substances necessary for smelting,—advantages not generally met with in America,—where the price of the daily labor of a miner is ten times as high, and where fuel is wanting, especially in Mexico, and in the Cordilleros, on account of the elevation of the mines above the level of the sea.

Although the electro-chemical treatment perfectly applies to the ores of Altaïa, and has recently been proved by a very considerable quantity submitted to this process, yet it must not be dissembled that in countries where fuel is abundant, and sea-salt rare, fusion will always be preferable, except in the case of complex ores, which are often a stumbling-block to metallurgists.

Silver mines are not very numerous in Russia: the only important ones, are those of Altaïa and Nertchtinsk. A few exploitations in the Caucasus and the Oura, may also be mentioned; but the great mineral riches of this kingdom chiefly consist in the auriferous and platiniferous sands, the washing of which,—the only treatment which they have hitherto been able to employ for extracting the gold and platinum,—at present occupies all the attention of the government. This washing, although carefully executed, is still imperfect, for a considerable portion of gold is not unfrequently lost in the sands. Nevertheless, the product is very considerable, since, in 1839, it was 6100 kilog., that is about 20,000,000 francs.

The auriferous and argentiferous galenas, which have been treated for silver and lead by the electro-chemical process, are perfectly disposed for the extraction of the gold by washing. Indeed this treatment requires a pulverisation, and a roasting which disengage the gold from the pyrites and other compounds which retain it; the silver and lead being removed, the ore is found reduced to nearly half its weight, and the washing may then be effected with great facility: the quartz and other light matters are in such a state of division, that a man who is well used to it may wash several hundred kilogrammes a-day. Its application has quite recently been made to the argentiferous galena, a few years ago discovered at Saint-Saintin-Cantalés, department of Cantal, and the quantity of whose gold did not amount to more than a decigramme and a half in 100 kilogrammes of ore, containing 30 per cent of lead. After the electro-chemical treatment and washing, we soon obtain residues which contain 8 grammes of gold, and even more which may advantageously be treated, whether by smelting or by carrying the washing farther. From this we are led to believe that the rocks of this country are auriferous, as also the etymology of Aurillac (*aurilacus*) would tend to prove.

These results confirm the advantages obtained by one of our brethren, in roasting auriferous pyrites, before washing them to extract the gold,—advantages which have been disputed in some countries, especially in Russia. It appears that the scarcity of fuel is the only obstacle to its application on the large scale in America.

Gold is generally found in Columbia, and in the United States, in the rocks known to geologists by the names of syenite, porphyric syenite, mica schist, and gneiss, and the quantity is so much the more considerable as the rocks are in a greater state of decomposition; it is the same in Russia where the auriferous rock is diorite; this general fact, which the principles of electro-chemistry turn to good account, has suggested a very simple mechanical process, which allows of the parts containing gold being immediately separated from those which are deprived of it, so that only a certain portion of the auriferous sands have to be submitted to washing.

If we afterwards seek to determine what advantages may result from metallurgical works, we shall see that they necessarily bring to a desert country the benefits of civilisation, and, where formerly nothing but unoccupied land was found, villages are built without delay; but if, by a wise foresight, power does not make its happy intervention felt, by encouraging agriculture, these localities, which are crowded by a rich population, may soon become nearly deserts, —of which Villa Rica, in Brazil, is an example.

In the time of its greatest prosperity, when the annual produce of the auriferous sands amounted to nearly 120,000,000 francs, its population amounted to 20,000 souls. For a century this vast product has gradually diminished; the inhabitants, wholly occupied in the washing, neglected the benefits which agriculture would have procured them in that beautiful and fertile country.

The distance from the metropolis, domestic troubles, carelessness of administration, and the exactions of power, caused many to emigrate. Scarcely does this town now present to the traveller, the shadow of its former splendor!

It is very different in the districts of the mines of Altaïa, where there is a working population of 25,000, and 120,000 agriculturists. The encouragements granted to the latter are such, that the best cultivated lands are those in the vicinity of the mines. Hence necessarily results an increase of population which will allow of greater scope being given to the metallurgical operations, as soon as all the hands are not occupied in the clearing and culture of the lands—the only means of peopling these vast countries.

If we now look at the other applications of electricity, we perceive that the same processes which serve for the treatment of metals—with some modifications, however—are successfully employed for gilding silver and copper objects,* to a degree of perfection which leaves nothing to be desired, and likewise for taking impressions in copper, of medals, bas reliefs and plates engraved with a graver, which have all the beauty and polish of medals. The galvanic moulds copy in relief all the prominent parts of these plates, and the cast copy gives impressions on paper. The number of good impressions which such a plate can furnish is very limited; but there is the advantage of being able to replace it by another, when it begins to wear out.

This power, which by turns becomes, heat, light and chemical power, is also capable of producing the effects of steam, so far as we can judge from experiments first made in the United States, and more recently in Russia; in the former, it has been applied to the use of a printing press; in the latter, to the navigation of the Neva.

A six-oared sloop, fitted with paddle wheels put in motion by an electro-magnetic machine, acting by means of a small voltaic apparatus, sailed up that river, against a very light contrary wind. Certainly if the expence necessary for setting in action an electro-magnetic machine capable of moving a man-of-war were calculated, it is probable that it would be of a nature to cause this new application to be at present abandoned; but when we reflect that bodies contain between their particles an enormous quantity of electricity, and that every day we are able to obtain a greater quantity of this power, at less expense, we are led to hope that we shall one day see it liberated in sufficient quantity to be applied to the purposes of navigation. Thus, far from rejecting the first attempts made in the north for substituting the employment of electric currents for that of steam, we should, on the contrary, encourage investigations, which, perhaps, will lead to the solution of one of the greatest manufacturing questions which could be proposed.

The powers by aid of which the metals are extracted from their ores have such energy, that they may one day be used for setting in motion apparatus for grinding, and making ores undergo the various mechanical preparations without which the treatment could not be carried on.

In the face of so many facts, whose importance is every day better appreciated, it is easy to perceive what the future may derive from the employment of a force whose power may be called infinite, which exists fettered and neutral wherever there is matter, and of which man will perhaps one day be able to make himself master.

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* For the process of gilding metals without mercury, by electro-chemical action, see "*The Chemist*," No. VI. page 180.

In examining the present in order to prejudge the future, we shall see that the imperative wants caused by the increase of population, resulting from the progress of civilisation, will require the forests to be cleared; that coal pits are not inexhaustible, and that a time must come when the scarcity of fuel will be a serious obstacle to metallurgical operations. This time is, it is true, yet very far distant, but let us now prepare, for the benefit of posterity, the means of extracting metals from their ores, and of carrying on various manufactures, without the intervention of fires.

ON THE ADULTERATION OF BREAD.

BY CHARLES WATT.

That the adulteration of bread is carried on in the metropolis and other large towns to a most serious extent cannot, for one moment, be doubted; indeed, the circumstance that there are in the branch of business which manufactures this chief commodity of life,—(which, if deficient, admits of no substitute,) two distinct classes of tradesmen, viz.:—one called "full-priced bakers," from their selling bread at the regular trade price, and the other, "cheap" or "low-priced," from their selling it at a lower rate, — naturally leads to such inference. When we consider the fact, which is well known, that the difference in price varies to the extent of two-pence, or more, in the four-pound loaf,—we can come to no other conclusion than that this vast difference, viz. one-fourth, can proceed from no other cause than the most extensive and culpable adulteration.

In order to satisfy public anxiety on this subject, it has often been submitted to attentive and close inquiry, and the answers received from these "low-priced" bakers are, universally, "that the reduction is dependent on their keeping no men to carry out the bread," while the replies from the high-priced bakers are, that "they use the best flour, and that those who sell cheaper must do otherwise."* That the trifling amount of wages thus saved can make up for so serious a difference in price as exists, is by far too ridiculous to be for an instant admitted.

Any one may, with very little trouble, be satisfied that there are very serious malpractices carried on with regard to the manufacture of bread, if he but take the pains to examine that purchased at different shops.

At some of the more respectable houses at the West End of the town,—from which the higher classes are supplied,—the bread is of a fine whiteness, is exceedingly light, and the crust is not hard and dry; while at those houses in the lower districts of the town where there is a crowded and poor population, it is of a very dark colour, is heavy, and the crust has a hard and compact appearance, which latter circumstance arises entirely from the quantity of inferior flour, and the admixture of a large quantity of potatoes.†

The adulterations of bread are of two kinds, noxious and innoxious; the noxious are such as may by repeated action become injurious: these are alum, sulphate of copper and zinc,‡ chalk, plaster of Paris (sulphate of lime), and bone dust.

With the observations of Dr. Ure, in his valuable work on the arts, "that it is a very serious thing for a lady or gentleman § of sedentary habits or infirm constitution to have their digestive powers daily vitiated by damaged flour, whitened with 197 grains of alum per quartern loaf: acidity of stomach, indigestion, flatulence, headaches, palpitation, costiveness, and urinary calculi, may be the probable consequences of the habitual introduction of so much acidulous and acescent matter,"—we entirely agree.

Alum may be detected in bread by treating the latter with distilled water, filtering the liquor thus obtained, first through calico, and then through blotting paper, till it is quite clear, then dividing it into two portions, into one of which is to be poured a few drops of nitrate or muriate of baryta, and into the other a few drops of liquid ammonia.

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* It must be observed, that the adulteration of bread is by no means confined to the "low-priced" bakers, for it may be policy for the "full-priced" dealers to keep up the farce of high prices, in order to check suspicion; for there are many who think nothing good unless it is dear.

† The method of detecting this adulteration is given by M. Sellier of Paris, and consists in subjecting suspected flour to the action of electricity. See *The Chemist*, No. VII. page 222.

‡ Sulphate of copper may be detected by acting on the poisoned bread with distilled water and testing the water with ferro-cyanate (prussiate) of potassa: the reddish-brown precipitate or tint, characteristic of copper, will appear even with small quantities. Should the poisonous substance be still more minute, the bread must be treated with very dilute nitric acid, either directly, or after incineration, in a platinum crucible, and the solution, after concentration by evaporation, should be tested by the ferro-cyanate of potassa. By this means the smallest quantities of sulphate may be detected.

§ He might have added the poor also, whose chief food it is, and who suffer so much to obtain it.

Chalk, plaster of Paris, or bone-dust may be detected by incineration of the bread containing them, and treating the ashes with nitric acid, which will dissolve the chalk with effervescence, and the plaster of Paris and bone-dust without. In each of these cases the lime may be rendered evident in the solution either by oxalic acid, or in preference, by oxalate of ammonia.

The innoxious adulterations are chiefly inferior flour,* rye flour, and also that of beans, peas, and potatoes, substances which, as possessing less fecula than wheaten flour, are very inferior in their nutritive properties, and, therefore, their introduction into bread is a fraud on the public, which requires the strictest vigilance to prevent, and should be punished by the highest penalties when detected.

As any adulterations of this kind can be discovered in the flour only before it is made into bread, we shall detail the means of testing the genuineness of flour.

Dr. Ure very properly observes that "every baker ought to be able to analyse his own flour."† The analysis is performed in the following manner. A ductile paste is first to be made with a pound of genuine flour, and a sufficient quantity of distilled water, and left at rest for an hour; then having tied across a bowl or basin, a piece of silken sieve stuff, a little below the surface of the water, the paste is to be laid upon the sieve on a level with the water, and kneaded gently with the hand, so as merely to wash the particles of fecula out of it. This portion of the flour immediately gets diffused through the water, some of the other constituents dissolve, and the gluten alone remains upon the filter. The water must be several times renewed until it runs off quite clear, and free from all milkiness. The last washings of the gluten are made by taking it out of the sieve, and holding it in the hand.

The whole of the turbid washings are to be put into a tall glass, or stoneware vessel, and allowed to remain at rest in a cool place until they deposit the starch. The clear supernatant liquor is then to be decanted off. The deposit consists of starch with a little gluten. It must be washed till the water settles over it quite clear, when it is to be dried.

The filtered waters being evaporated at a boiling heat, discover, floating through them, flocks, which have by some been supposed to be albumen, and by others gluten; at last phosphate of lime is precipitated. When the residuum has assumed a syrupy consistence by cooling, it is to be mixed with alcohol in order to dissolve out its saccharine matter. Cold water being added to what remains, causes a solution of the mucilage, and leaves the insoluble matter, containing azote with the phosphate of lime.

By this mode of analysis a minute portion of resin may remain in the gluten, and in the washing water; the gluten also retains a small portion of fixed oil, and a volatile principle, which may be removed by alcohol. If we wish to procure the resin alone, we must first of all treat with alcohol, the flour previously well dried.

When corn flour, deficient in gluten, is to be analysed, the dough must be inclosed in a linen bag, kneaded with water, and washed in that state.

When barley-meal is analysed according to the preceding process, a substance termed hordeine, mixed with fecula, is obtained; it may be separated by boiling water which dissolves the fecula, and leaves the hordeine.

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* In the mills near London, no less than seven different kinds of flour are ground out of one quantity of wheat.

These are for one quarter:

Fine flour	5 bushels	3 pecks.
Seconds	0	2
Fine middlings	0	1
Coarse middlings	0	0·5
Bran	3	0
Twenty-penny	3	0
Pollard	2	0
	14	2·5

† This observation is very important so far as the baker is concerned, but we are well aware that the flour often comes into his possession in a genuine state, and undergoes, while in his hands, a most serious amount of adulteration. It is, therefore, the bounden duty of the Legislature to provide some efficient means of putting a stop to so serious an evil. In this article, and likewise in other trades, adulterations are carried on to an alarming extent and with perfect impunity. A board of commissioners ought to be appointed to examine the various articles of life, such as food, medicines, important articles of commerce, &c.,—to condemn every bad article, and to fine those who thus violate the just laws and every duty to humanity.

Bread,—the most important of all articles of life to us all—the chief support of the poor—it is worse than wicked to adulterate. We hope, therefore, that some means of correcting so flagrant an evil will speedily be adopted.

In the preceding statement, having given a brief account of the various frauds on the community practised by those who are engaged in making that important article of food—bread, and the best means of preventing their occurrence, and likewise of detecting them when committed—we trust that we may be the means of attracting public attention to the subject; and if so, we shall consider our efforts not made in vain, nor shall they at any time be wanting to the furtherance of so desirable an object as the prevention of fraud.

KEENE AND CO'S MARBLE CEMENT.

The patentees form their cement by combination of the sulphates of lime and alumine, which they afterwards calcine at a red heat. The following is an outline of the process:—

A quantity of gypsum, (sulphate of lime,) in lumps, having the water of crystallization first evaporated in the same manner as in the manufacture of plaster of Paris, is to be placed in a large tank previously charged with several gallons of water, holding in solution a quantity of alum in the proportion of about one pound to each gallon of water; the gypsum must be allowed to remain in this solution until it has absorbed as much of the liquid as it possibly can. The stone thus saturated is then to be removed from the tank, and suffered to dry in the open air, after which it is to be calcined at a red heat, in a furnace, oven, or kiln, for the purpose of fixing the alum. The stone must then be reduced to powder, by any convenient apparatus, and if thought desirable, it may be sifted, when it will be ready for use.

For the finer kind of cement, the best quality of gypsum is to be selected, and instead of using the common alum of commerce, the clarified or concentrated aluminous mother liquor of the required strength, as being free from any alkali or other extraneous matter, is found best to answer this purpose.

This process for forming marble cement presents another instance of the value of chemistry to the arts, by the introduction of a most beautiful and durable substance, to which we feel it our duty to call the attention of our readers. By the kind permission of the sole manufacturers, Messrs. White and Son, of Milbank-street, Westminster, we have had an opportunity of inspecting it in all its forms and varieties, as well as the method of using it, and the purposes to which it is applied.

It is prepared of two qualities,—coarse and fine: the coarse is used as a plaster, and as a ground work; it is also used as a stucco for the exterior of buildings; for which purpose, in consequence of its resistance of wet, its hardness and its entire security from cracking—a fault so common in other cements—it is peculiarly applicable and advantageous.

The fine quality bears a very beautiful polish, and forms an elegant and unique production of the highest lustre and most delicate whiteness; capable of receiving every tint and shade of color, which taste or fancy can suggest, of being moulded or formed into the finest designs of architectural decorations, and possessing a hardness and durability greatly surpassing scagliola and other artificial productions.

In the art of forming cements, no longer will we yield the palm to the ancients, whose secret—so much boasted of by the antiquary—has for ages been lamented as lost for ever to mankind;—the marble cement is a proof of the ill-judged preference given to the works of antiquity, and will remain an imperishable monument of native ingenuity and application, which cannot fail of being duly appreciated by the artificer and the public.

ON THE MANUFACTURE OF FLINT GLASS.*

BY APSLEY PELLATT, ESQ.

Flint glass,—called by the French "cristal," from its resemblance to real crystal,—is composed of silex (whence the English name), to which is added carbonate of potash and litharge, or red lead: to the latter material is owing, not only its great specific gravity, but its superior lustre, ductility, and power of refraction. For optical purposes, it is necessary that flint glass should be perfectly free from striæ, otherwise the rays of light passing through it diverge and become distorted, and this defect is caused by the want of homogeneity in the melted mass, occasioned by the difficulty of perfectly fusing substances of such different density as the materials employed. The materials, being properly prepared, are thrown at intervals into a crucible of Stourbridge clay, which will hold about 1,600 lb. weight of glass when fused. The mouth of the crucible is then covered with a double stopper, but not luted, to permit the escape of the moisture remaining in the materials, as well as the carbonic acid gas and excess of oxygen. It requires from 50 to 60 hours application of a rapid, intense, and equal heat to effect the perfect fusion of the materials, and to drive off the gas; during which time the unfused particles and excess of salts are skimmed off as they rise to the surface. The progress of fusion cannot be resorted to, lest the intensity of heat requisite for the production of a perfectly homogeneous glass should be diminished, the quality of the product being influenced by any inattention on the part of the fireman, as well as by the state of the atmosphere or of the wind. It has been ascertained, that there is a certain point or crisis of fusion at which the melted metal must be kept to insure a glass fit for optical purposes, and even when that point be attained, and the crucible shall furnish proper glass during several hours, should there be such diminution of heat as to require the furnace to be closed, the remainder of the metal in the crucible becomes curdy and full of striæ, and thus unfit for use. It is the same with the glass made for the flat bore tubes for thermometers, which are never annealed, because the smoke of the annealing furnace would render the interior of the bore unfit for the reception of the mercury. These tubes will only bear the heat of the blowpipe when they are made from a metal which has been produced under all the favourable circumstances before described. It is, therefore, to be inferred, that the most homogeneous and perfect flint glass can only be produced by exposure to an intense and equable degree of heat, and that any excess or diminution of that heat is injurious to its quality. The English method of manufacturing the flint *plate* for optical purposes is thus described :—

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* Paper read at a meeting of *The Institution of Civil Engineers:* from *The Athenæum*, Aug. 18, 1840.

About 7lb. weight of the metal is taken in a ladle of a conical shape from the pot at the proper point of fusion, and then blown into a hollow cylinder, cut open, and flattened into a sheet of glass of about 14 inches by 20, and varying in thickness from $\frac{3}{8}$ths to $\frac{1}{4}$th of an inch. This plate is afterwards annealed, and in this state goes into the hands of the optician, who cuts and grinds it into the requisite form. When a glass furnace is about to be put out, whole pots of metal are sometimes suffered to remain in it, and cool gradually. The crucibles being destroyed, pieces of glass may be cloven from the mass of metal, softened by heat, and made to assume the requisite form, and then ground. It is believed that the excellent glasses made by Frauenhoffer, and other manufacturers on the continent, are produced by some such means. On attempting to cut glass ware, it is easily perceived if it be sufficiently annealed ; if not, the ware is put into tepid water, which is heated, and kept at the boiling point during several hours ; it is then suffered to become gradually cold. This method is more efficacious than re-annealing by the ordinary means. A piece of unannealed barometer tube of 40 inches in length being heated and quickly cooled, contracted only $\frac{1}{16}$ of an inch, whereas a similar piece, annealed by the usual means, contracted nearly $\frac{1}{8}$ of an inch. Unannealed flint glass, being heated and suddenly cooled in water, exhibits the appearance of a mass of crystals ; it is thence inferred that the process of annealing renders the glass more compact and solid ; it thus becomes incapable of polarization.

Flint glass being remarkably elastic, has caused it to be used for chronometers. To prove its elasticity, a hollow ball of unannealed glass of 3 inches diameter, weighing about 16 ounces, was dropped, *when cold*, from a height of 7 feet upon a stone floor ; it rebounded uninjured about $3\frac{1}{2}$ feet, but broke on falling to the ground after the rebound. Similar balls, both at a *bright* and *low red heat*, were dropped from the same height, and both broke immediately without any rebound ; thus demonstrating that its elasticity only exists while cold. Glass being sometimes deteriorated in the process of reheating, not only in color, but in its faculty of welding, by the sulphur existing in the coal or coke used in the furnace ; this is prevented by occasionally throwing about a quart of cold water on the fire ; the explosive vapour thus raised carries off the sulphureous gas. The process of annealing has the remarkable property of carrying off from the glass the reddish tint imparted to it by manganese, and in large masses, not only the reddish tint disappears, but the glass sometimes becomes green or blue, probably by the action of the sulphureous acid gas from the coke. The reddish tint will however return, and the greenish one disappear, should the annealed glass be afterwards heated or remelted. Should the pot crack during fusion, and the flame or smoke come in contact with the melted metal, a green tint and abundance of dense striæ will be the consequence. Such an accident can only be repaired, if the crack be accessible, by throwing cold water on the exuding metal, which thus becomes gradually cooled, and itself forms a lute, so as to enable the process of melting to be continued. Long experience has shown that the best fuel for melting glass in the furnaces is oven-burnt coke mixed with a small quantity of screened coal.

Mr. Pellatt illustrated the preceding paper by specimens of glass exhibiting peculiar effects of crystallization ; among them were cylindrical solid pieces of flint glass, which, from being suddenly cooled by plunging them into water, had the interior entirely dislocated, and were merely held together by the exterior coating ; portions of tubes showing the same effect ; a portion of a vase of white glass dipped into blue glass of a greater density—in cooling, the interi white glass appeared to be crushed by the contraotion of the exterior coating; a similar vase of white and blue glass of more equal density had cooled, and bore cutting without cracking; a mass of optical glass, exhibiting striæ, specks, and imperfections; which he explained together with the modes of manufacture.

SYMPATHETIC INKS.*

The name of sympathetic ink has been given to liquids which, when used for writing, do not, at first, leave any perceptible trace of the characters described,—which can be made to re-appear only by aid of chemical agents.

Sympathetic inks were formerly often employed in secret correspondence; for this purpose, between the lines written with ordinary ink, a second letter existed, visible only to the person written to, who was previously instructed as to the method of making the characters re-appear.

Various salts are indicated in chemical works as possessing this property. We may here give a few details on this subject:—

SYMPATHETIC INK WITH HYDROCHLORATE OF COBALT.

This ink consists of an aqueous solution of muriate of cobalt, of a light rose color, with which characters, which become invisible, are traced, and which, when the paper is slightly heated, appear of a blue color, afterwards gradually disappearing on cooling, and re-appearing by heat.

Muriate of cobalt, mixed with muriate of iron, yields a liquid which may be similarly employed; the characters, instead of blue, appear of a green colour.

SYMPATHETIC INK WITH ACETATE OF LEAD.

Characters traced with acetate of lead become visible when the paper is exposed to the action of sulphuretted hydrogen gas: these characters do not disappear.

SYMPATHETIC INK WITH SULPHATE OF IRON.

Characters traced with a solution of this salt, diluted with water, become visible on contact with a solution of the prussiate of potassa, or gallic acid. For this purpose a spunge steeped in a solution of prussiate of potassa, or gallic acid, is passed over the paper on which the characters have been traced. In the first case the characters appear of a blue color, in the second, black.

SYMPATHETIC INK WITH SULPHATE OF COPPER.

This ink was invented by Dr. Wurzer. Characters are traced with sulphate of copper, and made to re-appear of a blue color by holding the paper over a vessel containing volatile alkali. Thus is produced writing of a very beautiful blue.

GILDING WITHOUT MERCURY.*

M. Delarive, inventor of the process of gilding without the use of mercury, by electro-chemical action, (for which see *The Chemist*, No. VI., p. 180,) sent to M. Arago several silver and brass watch-cases and other articles gilt on his plan.

"The operation," says M. Delarive, "was performed by M. Droin, of the firm of Bautte and Co., closely following all the descriptions of the process, as pointed out by me. The success evidently is complete. However, I am persuaded that the improvements introduced by M. Bergeon have the effect of producing thicker and, probably, more durable coats of gold.

"M. Droin has made some curious observations concerning the influence of the state of the surfaces, and of the homogenity of the metal. He has observed, that the color of the gilding varies according to the nature of the metal operated on, all other circumstances being similar. Thus, Tyrolese brass took a gilding of a pure yellow color, and common brass, one of a reddish yellow. Rough surfaces are gilded as easily as smooth ones, as may be seen from the samples which I send."

LIGHTING-GAS FROM TURF.†

From several public journals it appears that M. Pahlenz of Grunsberg in Silesia, has made trials of the employment of turf for lighting, and that he affirms that 1000 turfs of 8 inches square, and 4 in height, were sufficient for lighting 50 street lamps, for 8 hours. The residue then presents a good coke for forges.

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* *Journal des Connaissances Necessaires et Indispensables*, May, 1840.

* *Academy of Sciences*, Paris, sitting of July 6, 1840.

† *Journal des Connaissances Necessaires et Indispensables*, May, 1840.

III. PHARMACY, &c.

MEDICAL REFORM.—PROPOSAL TO FORM A DRUGGISTS' ASSOCIATION SIMILAR TO THE BRITISH MEDICAL ASSOCIATION.

In a report made to the British Medical Association (given in *The Lancet*) of an interview between a deputation from that Association, and Mr. Warburton, which took place on the 25th of July, an expression is used on which we feel it our duty to make a few observations. After mentioning some of the principal provisions of the bill, the Report proceeds to say that "there are to be no provisions for preventing grocers, *chemists, druggists*, or empirics, from tampering with the public health, and interfering with the regular practitioners." If it succeed in preventing APOTHECARIES from "tampering with the public health," by drenching their patients with an unnecessary quantity of medicine, it will, in our opinion, perform very great service, and will be hailed with joy by all parties. This evidently is a direct INSULT to druggists: although it is complained that they "INTERFERE with the regular practitioners," yet no mention is made of the INTERFERENCE of the "regular practitioners" with the druggists. May we ask the writer of the above-mentioned Report if, in the proposed Medical Reform measure, it is contemplated to prevent surgeons and apothecaries from keeping OPEN SHOPS and SELLING DRUGS, as well as from TICKETING—from UNDERSELLING the chemists and druggists,—from PUFFING and ADVERTISING their nostrums,* and many other equally *dignified* practices resorted to by innumerable members of their degraded profession? Will it abolish the PER-CENTAGE SYSTEM? And, though last, not least, will it reform the present TRULY ABSURD SYSTEM of Medical Education?†

In the hope expressed in the concluding sentence of this very *liberal* Report,—that the association will be aided by the public as well as medical men in the just and laudable endeavours to render the profession more *respectable* among themselves, and much more *useful* to society,—we heartily join; considering that these are by far the most sensible objects they can have in view, and that they will require every assistance to enable them to accomplish so difficult a task. The respectability of the profession is indeed at a very low ebb, and its utility to society is very much in want of improvement. The division of the medical profession into its proper branches, alone can effect these objects.

The Public also is very deeply interested in any alterations and amendments in the medical profession; we therefore ask its assistance in securing such a system of Medical Reform as shall protect it from being drenched with medicine to satisfy the culpable cupidity of the apothecaries, and from ignorance.

We trust that the druggists will lend us their assistance in obtaining redress of their grievances. They should call MEETINGS in London and OTHER LARGE TOWNS, and ORGANISE their PLANS: they might even form an Association similar to the British Medical Association, to carry out their views. Such an association would, we feel convinced, immediately be thronged with members, and would be too powerful to be successfully resisted. To it we would cheerfully lend very efficient assistance: our pen should always be in readiness to aid it in its endeavours to obtain that which is due both to the druggists and the public.

We beseech chemists and druggists to act on the above suggestion, and we think there is no reason to doubt success. Our great object is to obtain a division of the branches of the medical profession, in which chemists and druggists will take up their proper position,—an object which will be obtained if the measures we propose be adopted—certainly not without.

There is no time to be lost: the meetings, if called, must be called AT ONCE:—we are sure they would be very numerously and respectably attended.

We suspend further comment for the present, but will resume the subject, and go more deeply into it, in our next number, by which time we hope to see the druggists take some decided measures, and begin the work in good earnest, and that they will no longer submit to "the oppressor's wrong."

MEDICAL REFORM AS RELATES TO DRUGGISTS.

To the Editors of The Chemist.

GENTLEMEN,—A degree of shortsightedness has marked the character of the virulent attacks which have of late appeared in medical periodicals, against the chemists and druggists, that betrays a great want either of justice or reflection. All sorts of unfair practice, in the way of prescribing, is alleged against them, and the immediate interference of the legislature solicited to prohibit it. I am much surprised at all this, because it is evident that whatever evil exists is entirely attributable to the surgeon-apothecaries themselves, who drive the public into the hands of the chemist, by their own ill-judged method of seeking remuneration for their services.

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* This practice, to the disgrace of the whole profession, is adopted by some of its HIGHEST members.

† In the remark of DR. BARLOW, at the meeting of the British Medical Association, that educational reform is the proper basis of all others, we entirely concur.

When legislative interference is sought with a body of men whose capital is embarked in trade, it ought at least to be shown that they are acting in a manner opposed to the wishes of the public; but in this case it is quite the reverse, as it is the public who seek to avail themselves of the chemist. Men think little of paying 6*s*. 8*d*. to a lawyer for his advice, but grudge it for a bottle of medicine. The root of the evil consists in the prescriber making his profit by sending medicine in large quantities at a high price, instead of taking a direct fee for his opinion, and writing a prescription: he thus defeats his own object—for his patients lose sight of personal attainments, and attribute everything to the remedial agent—consequently, they prefer paying a low price to a chemist for a pill and draught, to a high one to the apothecary. Let the surgeon-apothecary limit himself to prescribing only, and his character will stand much higher in the eyes of his patient; it will also remove all desire for competition on the part of the druggist, whom interest will then instruct to avoid all kind of responsibility, by reference to the general practitioner.

It would not, indeed, be very difficult to show, that all legislative enactments to prevent chemists from prescribing, without the above plan be pursued, must be UTTERLY FUTILE, as nothing can stop a druggist from attending to his private customers when they seek his aid in all simple cases, unless the inducement is taken away by his having the prescriptions (which in justice belong to him), as an equivalent. As to the assertion that we attempt to treat really serious cases, it is preposterous, because, if maltreatment really occurred, any chemist is of course amenable to law, yet notwithstanding the hostility of apothecaries, there is no such case on record.

I cannot conclude without remarking that a striking proof of the SUPERIOR accuracy of druggists' dispensing, is shown in the fact of young men, educated in the business, being in almost all cases preferred in the public hospitals—AT APOTHECARIES' HALL ITSELF—and in hundreds of private surgeries.

I am, Gentlemen,
Your constant reader,
A LONDON CHEMIST.
August 7th, 1840.

[Not only has a degree of shortsightedness, but also a degree of wilful and culpable misrepresentation and falsehood, pervaded the attacks lately made on chemists in certain medical journals. Every attempt is made forcibly to restrain chemists from prescribing, while the apothecary is to be upheld in selling drugs, and, as a natural consequence of such a system, the patient must be drenched with medicine, in order to remunerate his medical attendant for his services. If druggists will be true to themselves—if they will support us in our endeavours to obtain for them that of which, otherwise, they may unjustly be deprived—if they will be unanimous and unremitting in their struggles for justice, we doubt not but they will secure the DESIRED OBJECT.]

SALE OF DRUGS BY IGNORANT PERSONS.

To the Editors of The Chemist.

GENTLEMEN,—I was much pleased with some observations in your last Number, respecting the disgraceful practice of TICKETING adopted by certain individuals styling themselves surgeons, &c. Druggists really have much to contend with, especially in country towns, where almost every grocer and small shopkeeper is a retailer of drugs: they have no knowledge of quality,—cheapness is the only merit their articles possess; and we know there are houses in London who will supply drugs and chemicals at any price. I will give one instance, out of many, to show the ruinous effect on our trade. Pulv. potass. supertart. is worth, to buy, about 100s. per cwt.: one of my neighbours, a grocer, is selling it at 10*d*. per pound. I asked him how he could afford to sell under the market-price: he told me that he ordered it at a certain price, which left him a good profit; thus leaving quality quite out of the question.

We have, also, on the market day, people having drug stalls in the market vending their nostrums to the great injury of our trade. Now, I would ask, how can a druggist, whose pride it is to furnish the purest articles, contend with such a system as this? I hope the London and country druggists will not suffer the Medical Reform Bill to pass without calling the attention of the Legislature to the danger and impropriety of allowing ignorant persons to sell drugs.

I trust these few observations may be the means of arresting the attention of some more talented correspondent, and that with your assistance the best method of obtaining redress may be pointed out.

I am, Gentlemen,
Your obedient Servant,
H. STORY.
Hadleigh, Aug. 13, 1840.

NECESSITY OF CHEMISTS' APPRENTICES PAYING MORE ATTENTION TO THE STUDY OF CHEMISTRY.

To the Editors of The Chemist.

Gentlemen—I do not think you could better advance the interests of Chemistry, than by devoting a portion of your valuable magazine to the encouragement of a spirit of inquiry and a taste for experimental chemistry amongst the chemists' apprentices, the generality of whom are in a lamentable state of ignorance, as regards the science of chemistry, and every thing that does not fall under the daily routine of retail trade.

I trust, gentlemen, you will pardon the liberty I have taken in thus drawing your attention to this subject: it is a deep sense of the advantages which would result, were scientific chemistry, and the chemistry of the druggist more intimately connected, that has induced me to offer these few remarks.

I am, gentlemen,
Your obedient servant,
An Apprentice.

Chelsea, July 29th.

[We agree with "An Apprentice" in his opinion of the importance of chemists' apprentices acquiring more information than that which concerns retail trade only. They are indeed, in many cases, utterly destitute of any knowledge of the nature and properties of the drugs they serve, knowing nothing of them but their price. As we have some very important observations to make on the system of apprenticeships, pointing out its many inconveniences and abuses, and its utter unfitness for teaching the sciences and arts,—we will resume this subject in a future number. Want of space compels us to dismiss it for the present.]

SALE OF POISONS.

To the Editors of The Chemist.

Gentlemen,—I feel glad that my letter on the sale of poisons in your last number has attracted the notice of some of your correspondents, and, notwithstanding the attempt made by "A Subscriber" to throw ridicule on my suggestions, (which attempt you have shown to be truly ridiculous), I feel myself justified in reverting to the subject again, as one of very great importance both as regards the public and the druggists. I am borne out in directing public attention to the matter, in consequence of the alarming fact, that out of about sixty suicides which occurred during last month, twenty are stated to have been through taking poison. Surely such a dreadful sacrifice of human life loudly calls for legislative interference; it fully corroborates the opinion I before advanced, that there is too great a facility afforded the public in procuring poisons, and we are morally bound to do all we can to counteract this growing evil.

I trust, gentlemen, that this deeply interesting subject will meet the full consideration it is entitled to from your numerous and scientific readers, and that some satisfactory and effectual plan may be devised and introduced into the forthcoming Medical Reform Bill.

I am, gentlemen, yours respectfully,
Aug. 12, 1840. J. T.

[J. T.'s suggestion could not, we think, very easily be carried out to the fullest extent: it would be utterly impossible to insist on the presence of a witness in all cases. Poisons are sold to entire strangers, for manufacturing purposes, without that precaution being taken, yet but few accidents occur through this indiscriminate sale of them. Nevertheless, we recommend its adoption when practicable. Many druggists find it utterly impracticable,—others, very free from inconvenience. We think it our duty to attend to every suggestion relating to so important a subject. Want of space this month constrains us to postpone any farther observations on this subject to another opportunity.]

ON VARIOUS ADULTERATIONS OF LACTATE OF IRON.*

BY M. LOURADOUR.

In the March No. of the *Journal de Pharmacie*, I described a process for preparing crystallized lactate of iron (see *The Chemist*, No. V. page 160). Since that time, having had occasion to examine various samples of that salt, I have detected several adulterations practised with the aid of the pulverulent form, under which many manufacturers have thought it should be sold, and I hasten to make my brethren acquainted with them.

In some of these samples I have found sulphate of iron in the efflorescent state, or precipitated by alcohol; in others, starch or sugar of milk.

Nothing is easier than to detect the first of these adulterations by means of nitrate of baryta, which precipitates all the sulphuric acid of the sulphate of iron.

For the second, tincture of iodine presents an extremely active re-agent.

The third is less easy to detect, sugar of milk and lactate of iron being equally soluble in water, and insoluble in alcohol and ether. I succeeded, however, by means of nitric acid, which converts the sugar of milk into mucic acid. About two grammes of the suspected lactate of iron may be heated with thirty grammes of nitric acid, until the whole be reduced to about six or seven grammes. If the salt be pure the liquor remains clear after cooling; if it contain lactine, a white pulverulent precipitate of mucic acid is formed, the characters of which may easily be recognised.

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* *Journal de Pharmacie*, July 1840.

Doubtless these adulterations may be guarded against by testing pulverulent lactate of iron before using it; but the simplest and most secure way is to employ it only when under the form of crystalline plates, which will not allow of adulteration.

ON THE DANGER OF EMPLOYING LEECHES WHICH HAVE ALREADY BEEN USED.*

BY DR. PUCHE.

Many medical men having lately adopted the method of applying leeches even to the centre of inflamed ulcers, whatever may be their nature, and the high price of these reptiles inducing many persons to sell again those which have already been used—we have thought it right to mention the ill effects likely to result from such practice, of which the following observations, which we insert entire, in order to give the facts all their weight, furnish a striking example.

A young man, aged twenty-four years, was admitted into the *Hôpital du Midi*, for urethritis of four months' standing, which latterly had become complicated with acute epididymitis and syphilitic ulcers on the abdomen. He had been in the habit of once a week visiting the same woman, and had had connection with another, eight days before the appearance of the urethritis; he felt confident, he told me, of the good conduct (*des mœurs*) of his mistress, with whom he had lived for a long time, whom he had since seen, and who had not been ill: he attributed his condition to the woman whom he had but once visited. Four months after, in consequence of hard work, without the running having stopped, he was seized with epdidymitis of the left side, for which a great number of leeches was applied on the hypogastric region. Five of these leeches, which had been bought at a low price by a nurse, made punctures which inflamed and assumed the appearance of chancres. Having experienced but little relief, the patient then presented himself at the hospital for admission.

At this time, February 28th, 1840, the urethritis, which, for a long time, had not been painful, yielded a small quantity of a whitish pus: the ulcers spread very much, and were greatly irritated, and the inflammation of the epididymus was very intense. I immediately inoculated the running matter, as well as the pus from the ulcers, and applied emollient cataplasms to the testicle. *Usual diet; bathing.*

On the fourth of March, the inoculation of the urethritis had produced nothing, and that of the chancres gave a syphilitic pustule. The inflammation of the epididymus, which was the chief cause of the patient coming to the hospital, was totally abated. I commenced a mercurial treatment by the red sulphuret of mercury, in the dose of five centigrammes per day in a pill, dressing the leech-bites, with ointment of sulphuret of mercury.

On the 6th of March, the syphilitic pustule was profoundly ulcerated; the edges were hard, and it sunk in the middle. *A decigramme of mercury in two pills.*

On the 11th of March, the dose was increased to fifteen centigrammes; on the 14th, to two decigrammes; on the 18th, to twenty-five centigrammes; but the day after so large a dose of mercury had been administered, the patient complained of pains in the stomach and slight vomitings. I then suspended the use of the mercury, and purged him.

In the mean while the ulcers on the abdomen proceeded to cicatrization, and on the 25th of the same month, were entirely closed. For a few days following, I gradually increased the dose of the mercurial salt, until it amounted to five decigrammes.

The secretion from the urethra had in no wise diminished under the influence of this treatment. At the commencement of the month, I had tried, without success, injections of nitrate of silver, in the dose of a decigramme in one hundred grammes of distilled water. These injections irritated the canal to such an extent that I was obliged to desist from using them. I hoped that after the therapeutic inflammation, the running would cease, as is generally the case; but it was not so, and on the 15th of April, after five days' remission, I prescribed the use of cubebs in progressive doses, passing each day to one of the following terms:—ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, a hundred grammes, and thus re-descending from a hundred to ninety, eighty, seventy, sixty, fifty, forty, thirty, twenty, and ten grammes.

When we arrived at forty grammes in the ascending progression, this medicine gave rise to violent colics, followed by abundant evacuations which soon stopped, beginning again, however, an hour after each dose of the cubebs; but the treatment being continued the patient was better able to bear it, and the abdomen remained only a little freer. At the same time, general symptoms were manifested: the skin was hot and dry, and exhaled a powerful odour of cubebs. The patient said he felt flushes of heat rise to his face: he experienced fits of giddiness accompanied by a sensation of weight, as if his head were unwieldy, and as if he could not balance it. I arrived at fifty grammes of the cubebs, in the descending progression without the running from the urethra appearing modified, and as in administering this substance, the general treatment had been continued, I thought that the exciting action of the mercury had kept up the irritation of the canal. I suspended its use, and from that time, although the patient took only very small doses of cubebs, the running daily decreased, and entirely ceased by the 6th of May. The other symptoms had long since been cured. The cicatrix of the ulcer resulting from inoculation remained only a little indurated.

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* *Journal des Connaissances Medicales;* July, 1840.

REMARKS.

The clearly hunterian form of the ulcers which were developed after the application of the leeches would be sufficient to demonstrate their syphilitic nature: however, I wished to confirm my opinion by a proof which ought to be regarded as infallible, and from which I at the same time expected a certain indication by which to determine the mode of treatment to be adopted. I inoculated the pus and I obtained a fine pustule regularly developed, terminating in an indurated and cupreous cicatrix, such as frequently is seen after chancres of the skin.

To what cause can the appearance of syphilitic ulcers on the abdomen be attributed, except to the application of leeches which have before been on that part? Could it be from the connexion he had had, four months previously, with the woman from whom he got the urethritis? This could not be supposed, because primitive ulcers have never been known to appear so long after infection. Could it be attributed to the disease of the urethra, the matter of which had infected the leech bites? No, for the secretion was inoculated without success, a few days after the appearance of the chancres, and at the same time that the latter were inoculated. Indeed, the inflammation of the epididymus, which so frequently complicates blennorrhagia, but which was never known to supervene from a syphilitic discharge, confirms our opinion concerning the nature of this urethritis.

It must, therefore, be acknowledged that these ulcers arose from the bites of the leeches previously employed in a syphilitic disorder, and which carried the infection from one subject to another: in our opinion this transmission is very possible: but we feel that new facts are required, to render it more manifest. In our practice we will carefully note every thing which has a tendency to elucidate this subject; and at the same time we will examine a few secondary points, such as whether the leeches perish under the influence of the virulent principle which they have imbibed, whether this principle concludes by being dissipated, and in what time it disappears.

POISONING BY THE SWEET-PEA (LATTYRUS ODORATUS).—TREATED BY OXIDE OF ZINC.†

BY M. PUEL, OF FIGEAC.

The *lattyrus odoratus*, a leguminous plant, is very common in the south of France. Its beautiful colors and agreeable odour have acquired for it a place in our gardens. No one hitherto has recognised poisonous properties in it. The following fact, however, proves that it may occasion symptoms analogous to those caused by acro-narcotic vegetables.

On the 20th of July 1837, I was called in to a lady who exhibited every symptom of poisoning. In the absence of physicians I was obliged to render immediate assistance. The following are the observations which I made of the case:—

The pulse was strong and gave 120 pulsations: the pupil was much dilated: the eyes sunk; the tongue and lips were purple and swelled; the face very deeply colored; the veins of the neck full and prominent; the lower extremities cold.

The husband of the lady, being interrogated as to what had caused this state, gave me the following information:—

In the morning, at nine o'clock, Madame B—— had prepared and taken a cup of chocolate; she went into the garden, where she gathered a bouquet of sweet-pea, which she put in her mouth. Soon after, she set out with her husband to return to their residence in our town. Half an hour after their departure she felt a pain in the throat, accompanied by excessive thirst; she attributed this to the excessive heat of the day, but it gradually increased to the end of their journey. The patient could not articulate a word: she had almost entirely lost the use of her senses. I was then called in. I requested to be shown the bouquet which Madame B—— had carried in her mouth during her walk; it was composed of ten branches of sweet-pea. The total weight was about 24 grammes; the lower part of these branches was chewed for a third of its length. I attributed the symptoms which the patient experienced to the properties of this plant; and I proceeded to combat them, from the symptoms and from analogy, as I should have done in a case of poisoning by belladonna.

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* *Journal de Chimie Médicale*, August 1840.

TREATMENT.

At one P.M. an anti-spasmodic draught of 150 grammes, in which I put seven decigrammes of oxide of zinc: sinapisms to the lower extremities. At three o'clock the improvement was evident: Madame B—— had recovered the use of her senses; she articulated a few words; she complained of violent pains at the back of her head and at the epigastrium: lemonade with tartaric acid was given her as a drink. At six o'clock, a general bath. The improvement continued: she was able, on coming out of the bath, to walk about her room. The night was rather disturbed, and sleep painful. Next day the patient was well enough to go out.

Were the symptoms experienced the result of poisoning by an acro-narcotic vegetable? In this case would poisoning have been produced by the sweet-pea? I do not pretend affirmatively to resolve these two questions; but I think it right to take notice of this fact, in order that caution may be used until experiments shall determine the true properties of the *lattyrus odoratus.*

RESTORATION AFTER DROWNING BY THE ACTION OF VOLTAIC ELECTRICITY ON THE PHRENIC AND EIGHTH PAIR.*

BY DR. FERGUSON, SURGEON TO THE WESTMEATH INFIRMARY.

On Thursday evening, the 18th of June, I was requested to see James Rock, who had just been taken out of the canal, and was supposed to be dead. I was with him in four or five minutes. I forthwith had him removed to the County Infirmary, about 900 yards distant. Several persons said that he was six or seven minutes under the water, and that he had been intoxicated. Finding the abdomen very much distended, I immediately introduced the stomach-pump, and discharged by it upwards of a gallon of water, strongly impregnated with spirits. All the ordinary means of restoring animation failing, I tried a plan which I have long considered likely to bring about the action of the heart and lungs, by immediately acting on the diaphragm, and accordingly was prepared with the necessary apparatus. I made an incision below the seventh rib—cut down on that important muscle—laid it bare, and applied the conductors of a galvanic battery, consisting of fifty pairs of plates, to it. The effect was instantaneous, and surprised all the persons present. The muscles of the chest and abdomen became spasmodically engaged; after a few moments, I could see this spasmodic action gradually disappear, and the regular action of the chest come on, which soon increased till breathing became quite apparent, as also the circulation; and blood, now for the first time, issued from the wound I had made in the chest.

He has continued to go on well, under the use of the lancet, and the antiphlogistic treatment; and I have no doubt of discharging him, cured, very shortly.

This case will also go to prove, in my opinion, that it is not necessary to transmit along the *channel of the nerves*, this most wonderful agent, as a substitute for nervous influence.

The stomach-pump was of much use, as by relieving the great distension of the stomach, the lungs were better able to fulfil their function, upon the galvanic influence being applied. In cutting down and exposing the diaphragm, much caution is necessary, not to wound it, however slightly, the consequences of which might be very bad.

SULPHATE OF ZINC AS A VOMITIVE.†

BY M. TOULMOUCHE.

The employment of sulphate of zinc as a vomitive is not a new discovery; indeed, most authors have recognised it as such when it was required to evacuate, but at the same time to give tone to the stomach. Its use has been recommended in apoplexy consequent on indigestion,—in poisoning by narcotics,—in cases when a spider has been swallowed—in asphyxia from sinks, wells, &c.—against bilious fevers, when other emetics have proved unavailing—and in hysterical debility. Quercetan, Juncker, Fothergill, Crueger, Fischer, Lettsom, and many other practitioners have used it in the various maladies which we have enumerated.

M. Toulmouche, of Rennes, has lately made numerous experiments on this salt as a vomitive, and from his clinical experiments, he concludes:—

1st, That sulphate of zinc in the dose of 10 centigrammes exerts hardly any vomitive action:

2nd, That in the dose of 20 centigrammes it causes, in most cases, from one to two vomitage, and in two-thirds liquid stools:

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* From the *Dublin Medical Press,* July 1, 1840.

† *Journal de Chimie Médicale,* August 1840.

3rd, That in that of 30 centigrammes it almost always causes vomiting, and purges only in about half the cases:

4th, That in that of 40 centigrammes it gives rise, in four cases out of five, to vomiting, and in the fifth to purgation:

5th, That in the dose of 50 centigrammes this salt, in two cases out of three, provokes vomiting:

6th, That 60 centigrammes always causes vomiting:

7th, That in the dose of 75 centigrammes it determines vomiting in only one-third of the cases, and purgation in the remaining two-thirds:

8th, Finally, that, in more than one-third of the cases, sulphate of zinc gives rise to colics, in general, not very violent.

Remarks.—Lemery, in his *Cours de Chimie*, page 520, has described this salt under the name of *vomitive vitriol.* He has added to its use a note which we think worthy of insertion here:—

"The patient, after the effects of the vomitive, passes off by stool, matter as black as ink, because it frequently happens that some portion has found in the stomach a substance with which it combines, and a black substance is formed, similar to a mixture of vitriol with nut-galls.

However, it remains to be known whether sulphate zinc, Lemery's vomitive vitriol, was pure, or contained sulphate of iron.

ON PAULLINIA, A NEW MEDICAL SUBSTANCE.*

Dr. Gavrelle has lately published a notice concerning a new substance called *Paullinia.* This substance is extracted from a plant of the same name, brought from Brazil, and prepared by the Indians, and which appears to be possessed of a very energetic exciting action. Dr. G. has presented a sample of it to the *Société de Medicine*, as well as a new alkali which two chemists in Paris have separated from it by analysis. The extract and the alkali are very bitter, and are somewhat analogous to cafeine.

It is probable that the Paullinia, or the extract which bears its name, is procured from certain plants of the genus paullinia, (Octandria Tryginia), which consists of thirty species.

The products procured from the various kinds of paullinia, whose name is derived from these plants, having been dedicated to Simon Paulli, a medical botanist, who was born at Rostock in 1603, and died at Copenhagen in 1680. This learned man was author of several works, and particularly of *Quadripartitum de Simplicium medicamentorum facultatibus*, 1668, in 4to; of a work on the abuse of tea, tobacco, &c.

The *Paullinia Africana* is employed in Senegambia to stop flux of the blood; its bark, in powder, is applied to the affected parts. The bark of the *Paullinia Asiatica* is used at Bourbon as a febrifuge; in India the bark, leaves, and fruit, are used as a decoction, which is prepared with four grammes of these products, in venereal affections, in rheumatism, gout, and cutaneous diseases.

The seeds of the *Paullinia cupana* are used by the Indians of Oronoko; they mix them with cassava and water, leave them together, and when the mixed liquid begins to putrify, and acquires a yellow color and a bitter taste, they strain it and mix it with their common drinking water.

The *Paullinia Mexicana* possesses, according to Hernandez, the properties of sarsaparilla.

The seeds of the *Paullinia pinnata* are stupifying; at Brazil and the Antillæ they are used for intoxicating fish. The leaves of this species of paullinia are vulnerary, according to Pison. The *Paullinia serjania* also furnishes intoxicating seeds.

Finally, according to Martius, with the extract of the *Paullinia sorbilis* is prepared the product known in Brazil by the name of *guarana*—a medicine compounded by the Indians of Para, who give it the form of a sausage weighing from 125 to 250 grammes.

The color of guarana is brown; the mass is formed of lumps, which are not of so deep a color as the guarana at its surface. This product is hard, light, and inodorous; its taste is rather bitter, without being astringent. Gomez asserts that guarana is used in Brazil against dysentery, and in diseases of the urinary passages by relaxation, in doses of from four to eight grammes, in a glass of water. According to M. Batka, guarana contains a vegetable alkali—*guaranine.*

Dr. Gavrelle gives the following details concerning the species of paullinia which he has frequently used: he says that it is extracted from the *Paullinia sorbilis*, whose fruit resembles the cacao in colour: odour, *sui generis*, and a bitter taste, analogous to that of ratanhia.

It is prepared by separating the seeds from the capsules; they are exposed to the sun until the tegument may be separated by mere pressure; it is afterwards triturated and reduced to a fine powder.

M. de Chastitus found in it gum, starch, and a resinous matter of a reddish brown; a fat oil, tannin, and a crystallizable substance, possessing the chemical properties of cafeine.

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* *Journal de Chimie Medicale*, July, 1840.

In Brazil and in the neighbouring countries, its powder is mixed with cacao, and given in diarrhœa and dysentery, and as a tonic. Having brought it into France, Dr. Gavrelle has successfully used it in cases of chlorosis, long convalescence, phthysical looseness, headache, &c.: its use is the same as that of guarana.

MODE OF ADMINISTRATION.

From numerous and very carefully conducted experiments, it has been concluded that preference should be given to the hydro-alcoholic extract, as the most rational preparation, and as most accurately representing the properties of the plant.

PAULLINIA LOZENGES.

R. Hydro-alcoholic extract 21 gr. 3 decigr.
Sugar with vanilla ....560 gr.

Ft. *secundum artem*, lozenges of 6 decigrammes.

SYRUP.

R. Hydro-alcoholic extract ....10 gr.
Aromatic syrup..........1000 gr.

The dose may be carried to 14 grammes per day.

PILLS.

R. Hydro-alcoholic extract ....Q. S.

Make into pills of a decigramme each, with a sufficient quantity of liquorice.

POWDER.

R. Paullinia................4 gram.
Aromatic syrup ....16 gr.
Mix.

TINCTURE.

R. Hydro-alcoholic extract ....32 gr.
Alcohol at 22° ....500 gr.

OINTMENT.

R. Hydro-alcoholic extract......8 gr.
Lard ....64 gr.

ANTICEPHALALGIC PILLS OF DR. BROUSSAIS, IN CASES OF OBSTINATE HEADACHE.[*]

R. Extract of belladonna } ã ã gram. 0·00
Extract of hyosciamus }
Extract of lettuce . . . 1·00
Aqueous extract of opium . 0·21
Butter of Cacao . . . . 8·00
F. S. A. sixty pills.

Dr. Broussais recommends these pills in cases of inveterate headache, in the dose of one pill morning and evening.

TO CORRESPONDENTS.

T. L. S.—Camphor, when confined in bottles, and particularly when placed in the window, is, by the heat, gradually evaporated, and the vapour, being condensed, deposits on them the crystals we observe, and it is a curious fact, that they are always found in greatest abundance on that part which is nearest the sun. The other question is quite out of our province.

"A London Chemist," and J. T. may have the space they request.

Will "A Country Soap Boiler" send us his name and address.

Mr. Wasnidge shall be answered in our next.

We regret being prevented, this month, by want of space, from noticing THE DRUGGISTS' PROVIDENT ASSOCIATION, to the benevolent and laudable objects of which, we give our hearty approval. A notice of it shall appear in our next.

"A CHEMIST AND DRUGGIST NEAR LEEDS."—Sulphate of Copper, Arsenic, Sesquicarbonate of Ammonia, and Prussiate of Potassa, may be procured from Messrs. EVANS, BROTHERS, Red Lion Wharf, Upper Thames Street, London: we have always found their articles very good, and their prices very moderate.

Q.—We think J. H. was perfectly right in exposing the errors in Dr. Thomson's Conspectus, and that his animadversions were well merited. If they occurred only in the first edition, that is no excuse. J. H. *has* given the means of rectifying them, and, as every one who has the first may not go to the expence of the second edition of Dr. T's. otherwise very useful work, we think that in doing so he has done a service to the profession.

Want of space compels us to omit answering many of our correspondents of this month: those, therefore, whose questions are not answered, will find replies in our next.

Second Editions of No. I., II., and III. are ready, and may now be had of our Publishers, and may be ordered of all Booksellers and Newsmen throughout the kingdom.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

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[*] *Journal de Chemie Médicale*, June 1840.

THE CHEMIST.

I. CHEMISTRY.

ON AFFINITY OR THE POWER OF COMBINATION.*

BY M. H. AZAIS.

In nature a single motive cause produces all kinds of motion: that cause is EXPANSION. By the uniform action of that one force, every body, whatever its dimensions and its position in space may be, is perpetually endeavouring to spread its whole substance into a greater space, and, consequently, to drive away the surrounding bodies. But, in its turn, it is subjected, at its surface, to the equally expansive reaction of those surrounding bodies, so that expansion, considered in the whole of the universe, always keeps in exercise two general acts, balanced by one another—one for the purpose of dilating every body from its centre towards its circumference—the other, for that of condensing every body from its circumference towards its centre: the first, the immediate source of the phenomenon of heat; the second, the immediate source of the phenomenon of gravity. Between these two phenomena—the only immediate and absolutely simple—the only fundamental ones,—are placed the phenomena of mixed constitution, or in the production of which the two fundamental phenomena exercise different degrees of influence. Among these, AFFINITY is one of the most multiplied and most important. Guided by experiment and principle, we are about giving a definition and an explanation of it.

This word, *affinity*, adopted by philosophers, is of a metaphorical nature, borrowed from human relations; but its applicability having consecrated it and having rendered it technical, it shows how figurative the language of positive sciences may be, without being inappropriate to the subjects which it should express: a simple but striking evidence of the unity of nature.

With the philosopher, affinity is *molecular gravitation.* Like gravity, or central gravitation, it is a reciprocal action between the bodies which exert it. Such is their essential point of resemblance. But this action being, as we have said, a phenomenon of mixed constitution, it has also essential points of resemblance with heat; since, like it, it is exerted only on contact, and it is indefinitely variable in its intensity, whilst gravity does not bring in contact until after it has begun to act at a greater or less distance, and until, on the other hand, the gravity of all the bodies gravitating towards the same point, that, for example, of all the bodies deposited on the surface of the globe, is absolutely the same. Besides, ponderable bodies, in becoming attenuated, and in being divided, are ultimately liberated from the action of gravitation, by being rendered imponderable. Then, on the contrary, they are more subject to the action of heat, and that of affinity.

The tenuity of bodies, then, is a condition necessary to the exercise of affinity. But this condition is not sufficient, since, among bodies attenuated to a degree that renders them imponderable, some have a great tendency to combine: others, on the contrary, have but little tendency to do so, or are even repulsive of one another.

In molecular bodies, what is this condition of existence which so much favors their reciprocal gravitation, or renders it so much more, or so much less difficult? To find it, let us be present, in idea, at the first appearance of an imponderable molecular body, which we know to be eminently susceptible of affinity.

A globule of light from the sun arises from that star; it is by divergent expansion that it is projected; consequently, it is in a state of dilatation which arrives at independence. But, at the precise instant of evasion, it encounters the universal irradiation, the constant product of general expansion, at once independent and mobile, because it is perpetually renewed, because all its elements, coming from all points of the universe, are ever in the most vivid and the most rapid contrary motion, and, in obedience to the laws of expansion—a necessarily uniform power—always have a tendency to be distributed into space; which leads them to encircle, unite, press and contract the surface of all bodies which impede their uniform distribution.

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* A Memoir read to the *Académie des Sciences*, Paris, August 10th, 1840.

But the luminous globule, itself a focus of expansion, like all bodies in nature, and a very powerful one, being overtaken by a powerful, sudden contraction, suddenly reacts against it, is dilated to the same degree of oppression as it has just undergone, rushes on in its turn, to the agents of this oppression, which agents retire only immediately to return to the charge, in order to press, and, *de novo*, to contract the globule, which also again reacts, is dilated, again provokes contraction, and immediately repels it,—in a word, it is constituted in a state of continued vibration, which it retains during its passage through space, because there, and especially when at liberty, the universal irradiation penetrates, crosses and envelopes all the bodies not yet reduced to the tenuity of its elements, presses and contracts them, and provokes their expansive reaction.

Every subtile radiation, traversing space, is therefore ever alternately in submission to, and in domination over, universal radiation, which renders each of its rays intermittent. Thus is the theory of Newton, Laplace, and Biot, concerning the propagation of light, reconciled with that of Euler, Fresnel, and Arago: both are true. The emission of subtile fluids, by way of radiation, and the undulation, or, more accurately speaking, the continued vibration of each of their rays, are two inseparable facts.

Moreover, Newton, in observing and calculating *the alternate fits of easy reflection and easy transmission of light*, had already given an experimental and mathematical demonstration of its constant state of vibration. Latterly, the microscope has shown that this state of constant vibration is equally essential to the particles detached, by maceration, from vegetable or animal organic fibres, and from the debris of inorganic bodies, such as glass, granite and porphyry, finely powdered. Indeed the most important physiological act testifies that man, and all beings of elevated species, manifestly and perpetually obey this power of vibration. Every one respires, that is to say, is alternately dilated and contracted, and every one is constituted a respiring being, as the luminous globule is constituted a vibrating body; the human child, for example, expansively springs from the bosom of its mother, consequently in a state of dilatation. But, from the moment of its evasion, it is encircled, pressed and contracted by the atmospheric fluid: it cries, reacts, and is put with the same fluid in a permanent alternacy of subjection and preponderance.

Everywhere, in the universe, periodical pulsation is effected, sustained, impresses life, and characterises it. Thus, life is one of the essential, universal fruits of universal expansion; it is the greatest phenomenon of mixed constitution, perpetually produced by the continued balance of the two fundamental phenomena, two primordial general actions, one of which incessantly acts in dilating bodies,—the other, in condensing them,—and which, in nature, are always retained in equilibrium.

There is the most important mystery at once elucidated. The mechanism of affinity has now to be explained. We are about to glance at the direct agent of vital nutrition, respiration, and generation, and of all organic acts, all of which are acts of vibration, and of affinity.

Every molecular body, we say, perpetually vibrates. But is the amplitude of vibration of molecular bodies always the same? that cannot be; for the most of these bodies is indefinitely varied, and principle and experience show us that the smaller a molecular body is, the more rapid should be its vibration, for its obedience to the expansion which dilates it, and to that which contracts it, can be only so much the more prompt, as less matter is presented to this double impulsion. It is also evident that every elastic body of appreciable dimensions, an organ pipe, for example, which the percussion of the wind passing through it renders sonorous, vibrates with a swiftness which is accelerated in proportion to the diminution which its length or diameter are made to undergo.

Let us now repeat that the unique and universal force — expansion — is necessarily, by itself, a power uniform in its action; consequently, it incessantly tends to distribute matter and motion uniformly into space. We also see that water and all liquids—caloric and all subtile fluids—are ever endeavouring uniformly to occupy all the points of space allotted to them.

But this universal tendency towards uniformity becomes slow and difficult when applied to molecular bodies, proceeding from different sources, and very dissimilar among those of mass and vibration. If, on the contrary, projected towards the same space, these molecular bodies are equal in mass, and consequently, isochronal in vibration, the power of uniformity has but to intermix them equally and gently; its work is accomplished without confusion or disorder; no effort renders it perceptible.

Between these two extremes, the one, of perfect homogeneity, engendering languor and monotony; the other, of very considerable heterogeneity, engendering very great difficulty, there is evidently an indefinite number of intermediate terms, to each of which corresponds a more or less advanced degree of facility in the action of the power of uniformity.

What term of heterogeneity least resists this power of uniformity, or is best disposed for reciprocal combination? It is evidently that of two orders of molecular bodies constituted in such a manner that some make only one vibration, whilst others, twice as small and twice as numerous, make two vibrations in the same space of time: there, manifestly, are found the relations most favourable to harmony.

And if, in another binary group, the relations of mass and vibration are represented by the numerical relation of 2 to 3, the reciprocal combination, a little less prompt, is yet established with much facility. If the simplicity of the relation of the vibrations be still farther diminished—if it be represented by that of 3 to 4—the combination will become still less rapid: however, it will be easy.

But if the relation of the respective vibrations continues to deviate from mathematical simplicity, if it comes to be representable only by numerical relations gradually more dissimilar, such as 13 to 17, 19 to 33, 42 to 65, in such conditions, the power of uniformity will encounter a gradually increasing difficulty; ultimately it will be able to overcome it only by time and efforts.

That which we have just traced is a view of acoustics. If two orders of sounds, emitted in the same space, are in relations of mathematically simple vibrations, their combination is prompt and easy, and it produces *harmony*. If, on the contrary, the relations of their vibrations are dissimilar and confused, there will be irregularity and discordance, instead of combination and concert.

But is this view of sonorous concurrences at the same time that of chemical concurrences?—Undoubtedly. Indeed, the most harmonious musical affinity, and that most easy to obtain, is that of its tonic with its octave; and, in order to produce these two sounds in concurrence, two sonorous bodies must be struck together, one double the size of the other, for this reason one making only one vibration, while the other makes two; for this reason, also, the molecular emission of the first, half as rapid, but twice as deep, being necessarily half as numerous, being extended over a space half as great.

Now, in chemistry, the most complete reciprocal affinity, that most easily obtained, is that of two masses of gas, one oxygen, the other hydrogen, produced at the same time, by the two poles of the same Voltaic pile; and, of these two gases, whose magnetic equilibrium is strictly accurate, one, the hydrogen, is however twice the volume of the oxygen; which shows that its production has proceeded with twice as much rapidity, or that its components have twice as much tenuity. The relation of the two gases, then, is the same as that of the two octave sounds with one another; the facility of fundamental affinity in chemistry, is therefore explained by the same cause as the facility of fundamental affinity in music; the tonic gas—oxygen—has hydrogen for its octave; and thus is the demonstration completed.

In chemistry, if in a binary compound, such as acetic acid, hydrogen be eliminated and replaced by oxygen, a new compound is obtained, essentially similar to the preceding compound, but whose chemical properties are more distinct. In music, if in a binary harmony, a fixed sound be taken as the basis—the sound *sol*, for example, and if it be combined, at first, with the sound *ut*, an octave higher, afterwards with the sound *ut*, carried an octave lower in the first case, a fourth, *sol-ut*, is produced, in the second, a fifth, *ut-sol*. These two chords play the same part in harmony, only the harmony of the fifth is firmer and more consonant.

From such a similitude between facts of paramount importance, flows a theory common to chemistry and music. The following is a summary of it:—

In chemistry, as in music, the act of reciprocal affinity in its perfect degree, is the immediate fruit of perfect concordance, of concordance according to the relation of 1 to 2, between the vibrations of molecular bodies thrown into the same space. From this term, from this the most simple relation, the reciprocal affinity between molecular bodies is gradually weakened, in proportion as the relation between their respective vibrations diminishes in mathematical simplicity. When this relation has become dissimilar to a certain degree, there is no more reciprocal sympathy, no more affinity: each of the bodies which it is sought to combine, is so much the more opposed to it as, especially in chemistry, in which the motions have much less quickness than in music, each molecular body, repelled or delayed, necessarily finds, in its vicinity, other molecular bodies whose vibrations agree with its own; it in preference attaches itself to those which most easily attach to it.

Hence follows this law of general experiment:—THERE IS NO EASY SUCCESS IN ANY KIND OF COMBINATION EXCEPT FROM THE SIMPLICITY OF ITS COMPONENT PARTS.

Let this axiom guide us in the study of the facts of which nature is composed; it can have combined them only in their most simple relations. On their side, the most simple relations only can be the most general. Now, in very compound works, absolute unity is the supreme degree of affinity; it is therefore to the absolute unity of the principle which produces all the facts, and of the law which governs all their relations, that the most extended, the most compound, the most universal work owes its stability and harmony.

The investigation of this principle and of this law has, for fifty years, occupied my mind; and I am persuaded that it has not been in vain. It appears to me incontestable that expansion is the principle of all movements, and that the law which regulates the exercise of it is the continued balancing of all the effects of expansion. Every great particular discovery is but one of its developments. We may mention a striking and recent instance.

At one of the sittings of the academy, last month, heavy geological and historical documents, confirmed through M. E. Biot, the expansive theory of heaving up (*soulevement*): a theory which represents the terrestrial globe as being agitated, since its origin, by a desire to extend itself indefinitely into space, and of exploding! Why has this not happened? What exterior resistance reduces it to being able to make only difficult efforts? Above it, and around it, there are nothing but globes, and they are very distant.

But, like the earth, all these globes are expansive and radiating; but from their continued radiation round the earth, a contrary irradiation, which presses the terrestrial surface in every direction, contracts, condenses it, renders it hard to swell, to heave, and to open, allowing only the subtile radiation, emanating from the centre, to pass with facility, which radiation, in its turn, assists in the repression and preservation of the surrounding globes.

Thus, it is by their reciprocal conflict that the neighbouring globes are of mutual assistance to one another! A simple and salutary combination! Let our globe be liberated; let it overcome by its own expansion the surrounding expansion, what would it become? What, on our earth, one people conquering all the others would become,—it would instantly be dissolved.

EXPANSION IN EQUILIBRIUM! such is the term for this great enigma; it answers to all kinds of phenomena, since it expresses the initial impulse which is the origin of all kinds of motion.

Let the human mind, if desirous of comprehending every thing, take this principle for a guide; it will proceed with clearness and with firmness in search of universal truth. No more groping in the dark, no more vague and uncertain hypotheses. Necessarily, what the principle explains it makes certain; every investigation which it directs can lead only to demonstration, or indeed to evidence.

This it is that attaches my conviction to the Memoir which I have just read. Every thing flows from expansion in equilibrium.

ON THE PROPERTIES AND CHEMICAL CONSTITUTION OF COAL, WITH REMARKS ON THE METHODS OF INCREASING ITS CALORIFIC EFFECT, AND PREVENTING THE LOSS WHICH OCCURS DURING ITS COMBUSTION.*

BY CHARLES HOOD, F.R.A.S., &C.

The author considers his subject under the three following heads:—

I. The chemical character and composition of coal:

II. Its properties as a combustible:

III. The nature and application of its various gaseous products.

I. The opinion that coal is a compound of carbon and bitumen has been objected to by some chemists, on the ground that by no process hitherto pursued in analyses has it been possible to resolve it entirely into these two substances: even at a low temperature a quantity of gaseous matter is thrown off, and at an elevated degree of heat an evident decomposition of the bitumen takes place. Even anthracite contains a small portion of volatile matter, its component parts being carbon, oxygen, hydrogen and nitrogen; the hydrogen being either combined with the oxygen to form water, or with a small portion of carbon to form carburetted hydrogen, which exists in a gaseous state in the pores of the coal. In bituminous coal, the hydrogen is combined with a larger proportion of oxygen and nitrogen; the mechanical difference being, that the bituminous and free-burning coals (more particularly) melt by heat when the bitumen reaches the boiling point, whereas anthracite is not fusible, nor will it change its form, until it is exposed to a much higher degree of temperature. Two tables of the analyses of different coals are given from the authorities of Mushet, Thomson, Vanuxem, Daniells, Ure, and Regnault; No. 1 showing the proportions of carbon, ashes, and volatile matter, with the specific gravity of the coal and of the coke; and No. 2 showing the proportions of carbon, hydrogen, azote, and oxygen. These tables show that the largest quantity of carbon (92·87) is contained in the Kilkenny anthracite, and the least quantity (64·72) in cannel coal; and that the nature of the volatile matter greatly affects the quantity of coke—the aggregate quantity of the gaseous products of coking, splint, and cherry coal, being very nearly similar; while the quantity of coke obtained from these different species varies more than 45 per cent. The author then pointed out the continual presence of nitrogen, which quits the base with the greatest difficulty; and also the affinity of sulphur, not only for the coal, but for the coke, as it is rarely found to have been completely expelled even from the most perfectly made coke; the only coal found to be even partially free from it being anthracite, in some species of which no traces of its presence are found.

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* We select this article from several papers read before the Institution of Civil Engineers, on the 25th of August, and given in *The Athenæum*, No. 670. It is very creditable alike to the author's talents and reputation. Many of the remarks contained in it will be found of great practical value.

II. The application of coal as a fuel depends on the chemical change which it undergoes in uniting by the agency of heat with some body for which it possesses a powerful affinity. In all ordinary cases this effect is produced by its union with oxygen. When coal is entirely consumed, the carbon is wholly converted into carbonic acid gas and carbonic oxide, and the hydrogen into water in a state of vapour. The atmosphere supplies the necessary oxygen for this purpose; and in this state the products of the combination are nearly or quite invisible, both of them being almost colourless fluids; if, therefore, any smoke be visible, it is the result of imperfect combustion. Some calculations are given to ascertain the amount of loss that is sustained when the smoke escapes unconsumed; from which it appears, that with bituminous coal about 37 or 38 per cent. more heat is produced when the smoke is consumed than when it escapes freely. Many modes of consuming smoke have been attempted; those which appear to have been attended with the greatest success are:—

1st. Causing the smoke from the fresh coals to pass through or over that portion of the fuel which is more perfectly ignited.

2dly. Supplying heated air to the top of the fuel, as well as admitting cold air through the ash-pit in the usual manner.

3dly. Throwing a jet of steam into the furnace or into the chimney.

The various modes of carrying these plans into effect are briefly alluded to: a few may be selected from them. Robertson's plan was to use inclined furnace bars, where the fresh coals were placed close to the fire-door, and being there partially carbonized, gave out the gas which in passing over the mass of incandescent fuel was ignited, and became active flame, thus economizing fuel and preventing smoke. In this and similar cases, by the slow distillation of the coal, a gas is produced, which not only inflames at a lower temperature than the dense olefiant produced by rapid distillation, but which only reqires for its combustion a quantity of oxygen, never exceeding double its own volume, or ten times its bulk of atmospheric air, while olefiant gas requires three times its own volume of oxygen, or fifteen times its bulk of atmospheric air. The elimination of a gas which burns with so small a portion of oxygen is, therefore, the principal cause of the non-production of smoke in furnaces of this description.

The second plan of consuming smoke is founded on the necessity which exists for a large supply of air being requisite to inflame the gases given off from coal by a rapid and intense heat; and this is accomplished by introducing a quantity of heated air above the burning fuel. When a quantity of fuel is thrown into a furnace, the increased thickness of the mass opposes additional resistance to the passage of air through the bars; the temperature of the furnace is lowered, and an increased volume of gas is at the same time given out. If at this moment a quantity of air, heated to the temperature of the gas, be admitted, the gas immediately inflames, and that which would have produced a dense black smoke passes off in the invisible state of carbonic acid gas and vapour of water.

Different gases require different degrees of heat to inflame them; and this explains the easy combustibility of the volatile products of coal when the heat is so managed as to produce those gases which inflame at the lowest temperature. A larger quantity of air is required at the time that the coal is first thrown on, than at a subsequent period; therefore, when economy is studied, the supply of air should be gradually diminished as the mass approaches an incandescent state. The use of heated air has produced most important results in the manufacture of iron with bituminous coal, and also with anthracite; the latter fuel having been almost neglected until the recent application of this principle of employing heated air to promote its combustion, although it is known to be capable of producing perhaps a more intense heat than any other carbonaceous fuel.

The rationale of the third plan, of consuming smoke by injecting a jet of steam into the fire or the chimney, is less obvious than the others. In 1805, Mr. Davies Gilbert observed, that whenever the waste steam of one of Trevithick's engines was permitted to escape into the chimney, the smoke from the coal was rendered invisible. Subsequent experiments confirmed this fact; and it was supposed, that the steam being decomposed furnished oxygen to support combustion. The author combats this opinion, and accounts for the effect by the increased draught of the furnace caused by the jet of steam into the chimney, by which means a larger portion of air is brought into contact with the burning fuel; thus supplying the previous deficiency of oxygen to the fire, and promoting the combustion. As steam is only about half the weight of air at a like temperature, and the power of all gaseous fluids to ascend is "*inversely* as the square roots of their specific gravities," the velocity of its escape by the chimney, compared with common air of the same temperature, is about as 1·4 to 1; therefore the compound mixture of steam, air, and carbonic acid gas, will escape with a considerably increased velocity, and more air must consequently enter the furnace. It appears that about 10 per cent. of the total quantity of steam generated is necessary to effect the combustion of the smoke by this means; therefore, unless the waste steam only be used, the saving of the fuel must be reduced by this amount.

Brief mention is made of the experiments of Messrs. Apsley Pellatt, Parkes, and the Chevalier de Pambour, proving that a given quantity of oven coke will produce as much heat as the coal from which it was produced; and of the various kinds of artificial fuels which have been invented, especially that composed of resin and peat coke, of which the author remarks that its combustion probably produces a mechanical effect, as the hydrogen is converted into water in a state of vapour, which escapes through the chimney with a great velocity, and consequently a large quantity of air is drawn into the furnace, and a more perfect combustion of the fuel is the result. In the same manner he accounts for the necessity which exists for having the openings between the bars wider in a furnace in which coke is burned than in one used for coal. In opposition to the general opinion, he considers that less air is required for the consumption of coke than for coal; the carbon only requiring 2½ times its weight of oxygen for its combustion, while the hydrogen contained in coal requires eight times its weight of oxygen: and the only reason that the openings between the bars are required to be wider in the former than in the latter case, is in consequence of the draught being so much slower during the combustion of coke.

III. 'On the nature and application of the volatile products of coal.'

In treating this portion of the subject—many of the observations on which have been necessarily anticipated in the preceding sections—Mr. Hood traces the application of carburetted hydrogen gas to the purposes of artificial illumination from the year 1798, when its first successful application was made by Murdock at Soho; he then proceeds to Dr. Henry's investigations of the phenomena of its production and combustion; the variation of the intensity of light obtained from carburetted hydrogen, due to the proportion of carbon contained in it; the difference in the gas obtained from different qualities of coal; the superiority of the illuminating power of the gas from cannel coal; and the still greater power of that produced from the decomposition of oil, which is 2 to 2½ times greater than that of coal gas. He then mentions the other products of coal by distillation, ammoniacal liquor, carbonic acid and oxide, sulphuretted hydrogen, tar, essential oil, naphtha, petroleum, asphaltum, and other substances. The paper concluded by pointing out the advantages which would result from the production of such gas as is usually given out at the beginning of the distillation of coal, as it contains 2 volumes of gaseous carbon united with 2 volumes of hydrogen, and its illuminating power is consequently more than double that of ordinary coal gas.

Mr. Parkes observed, that the quantities of air required for the combustion of different fuels as determined in the laboratory and on the large scale of practice, were frequently very different. It might be quite correct that a given weight of coal would require more air for its perfect combustion than the same weight of coke. There was great difficulty in ascertaining the fact practically, under steam-boilers, as the gases given out by the coal must have air supplied to them distinct from that which passed through the grate to ensure their perfect ignition, and many circumstances prevented the consumption of air from being exactly measured. Generally, he had found it necessary to use wider spaces between the grate bars for coke than for coal. In some late experiments very carefully made on a boiler invented by Mr. A. M. Perkins, equal weights of coal and coke required the same time for their destruction on the same grate, the apertures of the damper and ash-pit door, which were used to govern the draught being precisely the same. Coke effected a greater evaporation than coal at similarly rapid and slow rates of combustion; and in every case the temperature of an oil bath at the foot of the chimney was higher with coke than with coal. It must, however, be remarked, that no process had been used to ignite the gases which escaped from the furnace uninflamed. He had tried different kinds of coke, coal, and anthracite at this boiler, and the same fuel in every instance performed a greater evaporative effect at a slow than at a rapid rate of combustion. He thought that much of the air which entered the grate of a boiler passed through the fire unconsumed, for want of time to effect a sufficiently intimate combination with the fuel.

In some experiments lately made at Swansea on the properties of anthracite, Dr. Schafœutl had found from analysis, that no less than 40 per cent. of the products of combustion taken from the chimney consisted of oxygen, yet he had effected the large evaporation of 11 lb. of water with 1 lb. of that fuel.

ON MYRRHOID, A NATURAL EXOTIC SUBSTANCE, RESEMBLING MYRRH, AND ON MYRRHOIDINE, THE PECULIAR PRINCIPLE WHICH IT CONTAINS.*

BY M. L. A. PLANCHE.

This substance made part of a collection which I procured, about two years since, from a druggist in Paris, and which he had himself chosen from a quantity of myrrh, so much was he persuaded that the selected pieces were the purest myrrh. Indeed, its resemblance to that gum resin must be very exact for a merchant, in the daily habit of seeing this drug, to be deceived; and that out of forty pieces which I tried, thirty-five were found to be false myrrh. For my own part, I must confess that I partook of the error: I should still have persisted in it, had it not been for a particular circumstance, which led me to examine things more closely.

Destitute as I was of any information concerning the origin of this natural product, I designated it *myrrhoïd*, because it is especially in its form that it resembles myrrh, and likewise to distinguish it from other false myrrhs.

Myrrhoïd, like myrrh, is presented in irregular drops: some are striated, of a fawn color, slightly opaque, and covered with a greyish dust: these are most numerous; others are of a reddish brown, more transparent, with a vitreous fracture, and are less rough externally than the preceding. Myrrhoïd, which has been long in contact with myrrh, retains a little of its odour; but it becomes inodorous, if, after having brushed it so as to remove the external dust, it be steeped in weak alcohol, and then exposed to the air for several days.

Myrrhoïd has a bitter, disagreeable taste, partaking a little of that of myrrh, but very acrid and peppery, which remains long in the mouth. Its powder is inodorous and of a yellowish white.

ACTION OF WATER ON MYRRHOID.

One part of powdered myrrhoïd triturated in an agate mortar with fifteen parts of water, gave an almost transparent, very slightly colored solution, from which, by settling, was separated a yellowish, soft substance, B, which did not dissolve in a fresh quantity of cold water: in the above-mentioned case it formed $\frac{3}{100}$ of the myrrhoïd: farther on we shall see, in treating of the direct action of alcohol, that it exists in it in larger quantities.

One part of powdered myrrhoïd (100 grains), triturated in an agate mortar, with two parts (200 grains) of water, yielded an opaque homogeneous mass of a mucilaginous consistence, which was diluted, always triturating, with about thirty parts of cold water: the almost transparent, slightly colored, liquor soon exhibited a multitude of small oleiform drops, which ultimately combined in a mass at the bottom of the vessel, having the appearance of a liquid resin, to which we shall soon recur, and which did not dissolve in a large quantity of boiling water.

Above it another prodigiously light and very bulky matter was held in suspension, giving to the liquid the appearance of a weak solution of gum tragacanth. I was unable to determine its quantity. This matter appeared to me analogous to tragacanthine.

If, instead of triturating the powdered myrrhoïd with water, the latter be left to act tranquilly for ten or twelve hours on the myrrhoïd, the solution is effected as above; but instead of the small portion of insoluble matter combining into a soft mass, it is presented in light flocks, floating in the liquid when stirred, and settling in it when allowed to stand. It may be remarked that myrrh, under the same circumstances, acts quite otherwise. The aqueous solution of myrrhoïd is very bitter and sour; it reddens turnsole paper. It is rendered turbid by alcohol, which precipitates white flocks from it, leaving the supernatant liquor perfectly clear and colorless. It is also rendered turbid by exposure to heat or the solar rays, and remains opaque until the evaporation is finished, leaving a yellow, dry, translucid matter, which again forms, with cold water, a limpid solution. This aqueous solution of myrrhoïd is almost entirely formed by a peculiar matter, which we will designate *Myrrhoïdine.*

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* *Journal de Pharmacie*, August 1840.

The resinous matter B, such as we separated it, in some measure mechanically, contained a certain quantity of water, which constituted it in its hydrated state. In this state it is insoluble in a fresh quantity of cold water and in boiling water; it obstinately retains, notwithstanding repeated washings, the sour and bitter taste of myrrhoïd: it is soluble in five times its weight of absolute alcohol.

This matter B, insoluble in cold water, was dissolved in alcohol. This solution, when very much diluted with water, did not become turbid; when set to evaporate, it remained transparent, then, as the evaporation procceded, little oily drops were perceived floating on the liquid, taking a resinous consistence in appearance, when they were brought to the dry side of the capsule. Dissolved in five parts of absolute alcohol, this matter reappears, on water being added to the solution, under the form of transparent drops, which caused this mixture not to appear turbid, but rather to assume the appearance of water into which a few drops of oil had been gently stirred with a tube.

The resin of myrrhoïd is not soluble in ether.

DIRECT TREATMENT OF MYRRHOID BY ALCOHOL.

Myrrhoïd, reduced to a fine powder, was exhausted by three successive decoctions in alcohol. The liquors, settled and filtered while warm, deposited nothing on cooling. Combined and evaporated at a very gentle heat, they left as a residue, a yellow transparent matter, extremely bitter and sour, of the consistence of turpentine, while warm: so capable was it of being drawn out when in this state, that by plunging into it, for the depth of one millimetre only, the extremity of a glass rod, this matter might be drawn out like melted glass. I have proved that a small mass of six centigrammes in weight thus gave a thread of more than two metres in length. In the flame of a candle it melted without inflaming and without smoke, like resins, and finished by turning black.

The matter obtained by alcohol is very bitter, but its bitterness is different from that of myrrh, to which succeeds a sour taste which remains for a very long time in the throat. When cold it is very soluble, without residue, in water, in alcohol and in ether.

It is the same matter as that which, under the treatment by water, we designate by the name of myrrhoïdine.

TREATMENT BY WATER OF THE RESIDUE OF MYRRHOID, INSOLUBLE IN BOILING ALCOHOL.

The portion of myrrhoïd, which had not been attacked by the alcohol, was heated to ebullition, with a sufficient quantity of water; it might likewise have been dissolved in a small quantity of cold water. The liquor was still farther diluted, in order to separate small portions of ligneous matter and siliceous sand, foreign to its composition.

This solution, being evaporated, left a residue which had the insipid taste of gum, without either a bitter or sour after-taste.

In equal weight the mucilage which it formed with water was scarcely so thick as that of gum Acacia. But if it be borne in mind that gum arabic, dissolved and dried, retains 17 per cent. of water, according to M. Berzelius, it will be seen that the two mucilages are very nearly similar.

Under the same circumstances, M. Pelletier has seen the gum of myrrh produce a mucilage thicker than that of ordinary gum. The gum of myrrhoïd renders oils miscible with water, in the same manner as gum-arabic.

When myrrhoïd is directly treated by boiling absolute alcohol, so as to take up every thing soluble in that menstruum, ten per cent. of myrrhoïdine is obtained: the remainder is gum.

When, on the contrary, alcohol is made to act only on the portion of myrrhoïd soluble in cold water, 7 per cent. only is obtained from it, and that is as it should be, the $\frac{3}{100}$ having been separated by the water. Whence it follows that the dried product of the aqueous solution of myrrhoïd is a kind of definite compound, represented by seven parts of myrrhoïdine and ninety-three of gum, and that normal myrrhoïd is composed of—

Myrrhoïdine	10
Gum, about	88
Tragacanthine, or foreign matter	2
	100

ACTION OF ETHER ON MYRRHOID.

Powdered myrrhoïd having, when cold, been stirred with ether, at the expiration of an hour, the latter is decanted. This ether, evaporated in the open air, left an oily matter, which soiled paper, like a fat oil, and the stain remained on the paper after exposure to heat, and did not extend farther: the paper again became dry, as if it had been impregnated with a resin. It will be seen that it can be neither a resin nor a fat oil, for this matter, which adheres to the fingers when the capsule is gently heated, is completely dissolved in cold water, without impairing its transparency: it also dissolves in alcohol, and the alcoholic solution is not rendered turbid by water, in whatever proportion it may be added to it. I do not know any oil or resin possessed of these properties.

It was myrrhoïdine again which was here dissolved by the ether.

MYRRHOIDINE.

Myrrhoïdine has the appearance of gum-arabic: its taste is bitter and sour.

It dissolves in water as easily as does the purest gum. It is likewise soluble in alcohol and in ether. It readily enters into fusion.

Blotting paper steeped in it is stained as it would be by a resin; spread on sized paper, it gives it the brilliancy of a fine varnish.

Myrrhoïdine is very soluble in spirit of turpentine. Olive oil, cold, or heated to a temperature incapable of decomposing it, not having any action on this substance, it melts, but does not become incorporated with the oil, and sticks to the tube with which one may try to divide it. It may be ascertained that the oil does not retain any solution, by tasting the oil after it is cold, or by treating it with ether after having decanted it.

The aqueous solution of myrrhoïdine does not alter the color of turnsole or turmeric paper.

$$\left.\begin{array}{l}\text{Sub-acetate of lead,}\\ \text{Nitrate of silver,}\\ \text{Muriate of tin,}\\ \text{Sulphate of copper,}\end{array}\right\}\begin{array}{l}\text{were without effect}\\ \text{on it.}\end{array}$$

Sulphate of iron renders it slightly turbid.

With tincture of galls it became turbid, turned white, and formed a white precipitate, soluble in an excess of alcohol.

With a solution of pure tannin the same results.

Myrrhoïdine completely dissolves in liquid caustic potassa: the solution, on being saturated with nitric acid, became green and transparent.

Ammonia acted in the same manner as potassa.

If pure hydro-chloric acid be made to act, without heat, on the dried bitter matter, in proportion as the solution is operated, the acid assumes a yellow color, like that of Malaga wine, very soon passing to brown: a peculiar aromatic odour is disengaged.

The addition of water to this solution precipitates from the myrrhoïdine, under the form of glutiniform filaments. This deposit, washed, in order to separate from it the excess of acid, lost nothing of its bitter and sour taste: its solubility in water was very considerably diminished. This matter dissolves in absolute alcohol, as before; but by that same, as it had lost its affinity for water, this liquid rendered the alcoholic solution turbid, as it would have done a resinous tincture, or alcohol, charged with a certain quantity of essential oil.

Pure concentrated sulphuric acid, poured on powdered myrrhoïdine, dissolves it without disengaging sulphurous acid. This solution has exactly the same tint as black balsam of Peru. Diluted with water, it becomes turbid, passing to a dirty white, and soon deposits very light flocks of the same color.

Nitric acid dissolves myrrhoïdine without disengaging nitrous gas. The solution, which is of a light yellow color, is rendered turbid by the addition of a small quantity of water. Diluted farther, it again becomes limpid.

Soda, potassa, and ammonia, whether caustic, or in the state of carbonate, do not produce in it any appreciable effect.

ON ESSENCE OF BERGAMOT.*

BY MM. E. SOUBEIRAN AND H. CAPITAINE.

Our experiments on camphenes left us undecided as to whether the different products obtained by the distillation of the essence of bergamot, pre-existed in that essence, or were the results of decomposition.

The following observation tends to prove that essence of bergamot is composed of several essential oils, which are of different degrees of volatility, and which are unequally divided in the products. Essence of bergamot, obtained by pressing the zest, was distilled by the intervention of water, and dried by means of chloride of calcium: its density was about 0·869. Observed in a tube of 100 mm., it caused the plane of the polarisation of light to deviate + 25° ↗. It was redistilled with water, and the products were collected in four portions. The essence first distilled had a rotatory power of + 45° ↗: the next essence deviated + 38° ↗: the third product had a deviation of + 21° ↗: and the last had no power of rotation. The mixture of all the essences should have given a mean deviation of + 26° ↗. Experiment, therefore, satisfactorily proves that essence of bergamot is composed of at least two different oils, one of which, more volatile, has a very great rotatory power, and the other, less volatile, has no action on the rays of polarised light.

In our work on camphenes, we had not analysed the essence of bergamot, and, according to very natural analogies, we ranked it with the essence of lemon and orange. However, M. Ohme has lately published in the *Annalen der Pharmacie*, analyses of this volatile oil, which gave him 7·098 of oxygen, per cent., which circumstance has induced him to consider the essence of bergamot as a hydrated essence of lemon. The numbers found by M. Ohme perfectly agree with the formulæ 3 $(C^{10} H^{16}) + 2 (H^2 O)$.

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* *Journal de Pharmacie*, August, 1840.

0·2925 of the first distilled essence yielded us:—

Carbonic acid . . .	0·890
Water	0·267
Or per cent.:—	
Carbon	84·98
Hydrogen	10·12
Oxygen	4·90
	100·00

The essence, which had furnished the preceding results, was submitted to distillation in a retort, by which means none but the most volatile parts were collected, which, in their turn, were analysed.

1st. 0·264 grammes of matter gave:—

Carbonic acid . . .	0·814
Water	0·271
Whence	
Carbon	85·25
Hydrogen	11·38
Oxygen	3·37
	100·00

2nd. 0·2605 grammes of matter yielded:—

Carbonic acid . . .	0·797
Water	0·270
Or,	
Carbon	84·59
Hydrogen	11·49
Oxygen	3·92
	100·00

These two analyses may be interpreted thus:—

1st. Essence $C^{10} H^{16}$ . .	96·32
Water	2·70
Oxygen in excess . .	0·89
	100·00
2nd. Essence $C^{10} H^{16}$ . .	95·59
Water	4·41
Oxygen	0·00
	100·00

A rectified essence of bergamot, which had not been divided into several products during distillation gave 6·07 of oxygen; indeed, the last product of distillation resulting from another operation, yielded 16·94 per cent. The following are the details of this experiment:—

0·310 grammes of essence (last product) yielded:—

Carbonic acid . . .	0·819
Water	0·303
Whence	
Carbon	73·03
Hydrogen	10·83
Oxygen	16·14
	100·00
Or	
Essence $C^{10} H^{16}$ . .	82·50
Water	12·26
Oxygen in excess . .	5·24
	100·00

These experiments, like those of M. Ohme, show that essence of bergamot contains a certain quantity of oxygen: they do not absolutely contradict the supposition of that chemist, that this oxygen is in the state of water. But they do not allow it to be admitted that this essence is entirely constituted by a hydrate. The numbers corresponding to an atomic formula obtained by M. Ohme, are true only for the essence on which he operated, and they would certainly have shown themselves variable, if M. O. had separately analysed the different products resulting from the distillation of the essence.

We are of opinion that essence of bergamot contains one or two oils of the order of camphenes $(C^{10} H^{16})$; a hydrate whose composition is unknown to us, and probably also a small quantity of an oxygenised essence, which, doubtless, is formed by absorption of the oxygen of the air. Indeed, M. Ohme found in the deposits from the essence of bergamot, a stearopten (Bergaptene, Ohme), which contains 67·9 of carbon 3·65 of hydrogen, and 24·45 of oxygen.

We have in vain tried to make the essence of bergamot take up a greater quantity of water. For this purpose, we boiled it with water, for forty-eight hours, in an apparatus which condensed the vapors and returned them into the distilling vessel. The essence, analysed after this treatment, gave, as before, 6·07 of oxygen per cent.

Anhydrous phosphoric acid gives the means of separating all the water which may be supposed to constitute the hydrated essence of bergamot. Indeed, this essence well dried and put in contact with flaky phosphoric acid, is strongly heated and becomes colored: if it be separated from the acid deposit, and distilled, an entirely colorless product is obtained, which has not the smell of bergamot, but which possesses one similar to that of terebene. The essence of bergamot, which had a power of rotation of + 40° ↗, before the action of the acid, after its transformation, had a rotatory power of but + 40° ↗, which, probably, would have been altogether wanting, had we used a larger quantity of phosphoric acid.

This product possesses the property of combining with hydrochloric acid, but we have not been able to ascertain the composition of the liquid camphor which it forms.

The phosphoric acid used for depriving essence of bergamot of its water, combines with a portion of organic matter, and forms an acid of the class of the vinic acids (*phospho-bergamic acid*), which, like them, gives with lime, and oxide of lead, salts which are soluble in water.

The essence which results from the action of phosphoric on the volatile oil of bergamot, gave, by analysis, the following results:—

1st. 0·313 grammes of matter furnished:—

Carbonic acid	1·006
Water	0·324
Whence	
Carbon	88·86
Hydrogen	11·48
	100·34

2nd. 0·297 grammes of matter yielded:—

Carbonic acid	0·955
Water	0·310
Whence	
Carbon	89·00
Hydrogen	11·57
	100·57

It is the composition of citrene and essence of lemon.

M. Ohme found that essence of bergamot, into which he had poured hydrochloric acid, contained 7·69 of chlorine per cent. The results at which we arrived are different, which evidently arises from M. O. in distilling his camphor with water, in order to purify it, having decomposed the greater part of it.

0·427 grammes of camphor of bergamot, bleached by filtration with purified animal charcoal, gave:—

Carbonic acid	0·973
Water	0·354
Whence	
Carbon	63·00
Hydrogen	9·19
Chlorine	27.81
	100·00

A camphor isomeric with the camphor of lemon, should have furnished 33·5 of chlorine per cent: we shall not hesitate to acknowledge that such, indeed, is the composition of the camphor of bergamot, if we consider that the essence which is used for preparing it always contains a little oxygenised oil, and that, besides, the camphor of bergamot ought, like the liquid camphor of lemon, to lose part of its acid, with the greatest facility.

ACTION OF ANHYDROUS SULPHURIC ACID ON ACETIC ACID.*

BY M. MELSENS.

Acetic acid, treated by sulphuric acid, gives rise to sulpho-acetic acid, which in the crystallized state, is represented by

$$C^8 H^4 O^3, S^2 O^5 + 5 H^2 O.$$

MO being a metallic base, the anhydrous neutral salts are represented by

$$C^8 H^4 O^3, S^2 O^5 + 2 MO.$$

MEMOIR ON CHLOROXALIC ETHER AND ITS COMPOUNDS.†

BY M. F. MALAGUTI.

The author sums up the results of his labours in the following words:—

The hydrogen of oxalic ether may be completely replaced by an equivalent quantity of chlorine: the chloroxalic ether, which then results, produces oxamide, with liquid ammonia, and gives, with gaseous ammonia, chloroxamethane, in all respects resembling oxamethane. Under the influence of liquid ammonia, chloroxamethane is converted into chloroxalovinate of ammonia, from which may be obtained, by proper means, chloroxalovanic acid, which differs from oxalovinic acid in its containing chlorine instead of hydrogen. This acid may be obtained in the anhydrous state, by making alcohol act on chloroxalic ether, which may also give rise to the production of a peculiar acid, by the oxygenising action of the alkalies.

The most striking result of these experiments, in my opinion, is the preservation of the chemical properties of oxalic ether, after it has lost ten atoms of hydrogen, and gained ten atoms of chlorine. Truly, we are acquainted with other examples of such preservation, but they are drawn from reactions produced by the decomposition of the chemical particles of the substance examined, which might not be so decisive as a case in which there was no decomposition, but a simple modification.

Let any one examine the subjoined table, in which are laid down, comparatively, all the transformations of oxalic and chloroxalic ethers, and he will speedily be convinced that one of the series is but a repetition of the other.

I have not adopted the rational formula for oxalic ether, for I considered it useless to do so. Whatever theory may be adopted for interpreting the constitution of oxalic ether, the resemblance between the two series will not be the less striking.

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* *Compte Rendu de l'Academie des Sciences*, No. 8, Aug. 24, 1840.

† *Academy of Sciences*, Sitting of August 3, 1840, from *Comptes Rendus*, No. 5.

Oxalic ether and its derivatives.	Chloroxalic ether and its derivatives.
Oxalic ether $C^{12} H^{10} O^4$	Chloroxalic ether $C^{12} Cl^{10} O^4$.
Oxalovinic acid $C^{12} H^{10} O^4, C^4 O^3$	Chloroxalovinic acid $C^{12} Cl^{10} O^4, C^4 O^3$.
Hydrated oxalovinic acid $C^{12} H^{10} O^4, C^4 O^3, H^2 O$	Hydrated chloroxalovinic acid $C^{12} Cl^{10} O^4, C^4 O^3 H^2 O$.
Oxalovinates $C^{12} H^{10} O^4, C^4 O^3$, B O.	Chloroxalovinates $C^{12} Cl^{10} O^4, C^4 O^3$, B O.
Oxamethane $C^{12} H^{10} O^4, C^4 O^2 Az^2 H^4$.	Chloroxamethane $C^{12} Cl^{10} O^4, C^4 O^2 Az^2 H^4$
Oxamide $C^4 O^2 Az^2 H^4$	Oxamide $C^4 O^2 Az^2 H^4$.

ON THE PROTEINE OF THE CRYSTALLINE LENS OF THE EYE.*

BY M. J. MULDER.

This substance was discovered by Berzelius; according to that chemist, it forms 35·9 of the crystalline lens of the eye, and does not become, like albumen, a coherent mass, but a granular one. In other respects it has the same properties. This new product was obtained in the following manner:—

The crystalline lens was carefully separated from fifty bulls' eyes, washed, the cell torn away, and water was added; it was then filtered. The liquor, heated in the sand-bath, immediately coagulated, and precipitated clots. After desiccation, the bruised mass was submitted to the action of alcohol and water, and to ebullition; after that it was dried at a temperature of 130°.

Obtained thus, this substance is white, and enjoys all the properties of albumen; but it cannot easily be pulverized. When it was put, with a solution of potassa, into a silver vessel, the latter turned black, which shows that it contains free sulphur: it does not contain free phosphorus.

0·170 produced 0·001 of white ash.

The composition of the crystalline lens of the eye is as follows:—

Carbon	. 55·59	or	40	atoms.
Hydrogen	6·94	or	62	,,
Azote	. 16·54	or	10	,,
Oxygen	. 21·16	or	12	,,

The quantity of sulphur is about 1 atom to 15 of proteine.

The substance of the crystalline lens dissolved in nitric acid, mixed with a solution of nitrate of iron, and precipitated by ammonia, yielded the same quantity of phosphorus as a muriatic solution of the same matter. Phosphoric acid arises from the phosphate of lime; after that the substance does not contain free phosphorus.

If the crystalline lens, when very dry, be introduced into sulphuric acid, it swells up, and is converted into a gelatinous and transparent mass, like the proteine of caseum, of fibrin, &c. By the addition of water, it contracts and gives a hard powder.

After various considerations, the author concludes by saying that it is beyond doubt that the principle of the crystalline lens of the eye is proteine, for it possesses the same composition and the same atomic weight as pure proteine of albumen, fibrin, caseum, &c.

ON CHELIDONINE AND PIRROPINE.†

BY M. POTEX.

M. Potex has lately found, in the root of the *Chelidonium majus*, a true alkaloid (*chelidonine*) and a sub-alkaloid (*pirropine*) analogous to narceine and narcotine, to which the juice owes its color. By distilling this plant in flower with the root, with or without alkali, products having the narcotic odour of this vegetable are obtained.

In the distilled acid product, obtained without an alkali, formic and acetic acids are manifested: that obtained by the addition of potassa contained ammonia.

PREPARATION OF THESE TWO ALKALOIDS.

The dried root of the *Chelidonium majus* is reduced to a coarse powder, and twice boiled in alcohol: these infusions being distilled, are poured into a retort, an equal quantity of distilled water being added: the alcohol is removed by a fresh distillation. The residue is put in a capsule; by complete cooling, a soft resin separates from it; it is filtered, and the two alkaloids are precipitated from it by means of subcarbonate of soda. It is filtered a second time, and the precipitate is washed in cold water, and dissolved in alcohol boiling at 84°; it is filtered and left to cool. By operating thus, the greater part of the chelidonine crystallizes; by the evaporation of most of the alcohol, the remainder does the same. The crystals thus obtained are washed with alcohol, in order to free them from all extractive matter. The supernatant and the washing liquors are evaporated at a gentle heat; pirropine then crystallizes with a small quantity of chelidonine: its crystals are in yellow plates; some portion is deposited on the sides of the vessel, in blackish disks.

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* From *Bulletin de Neerlande.*

† *Journal de Chimie Médicale*, August, 1840.

It is well to observe that too small a quantity of this root should not be acted on, because the proportions of pirropine are so very minute. The greatest part is shown with an extractive matter, aqueous or resinous: this latter dissolves in dilute acids; it is precipitated from them by the alkalies, but it is uncrystallizable: it is more particularly combined with the soft resin, with which it forms, together with chlorophylle and a fatty substance, an union so intimate that it is very difficult to separate it. It appears that pirropine is found more especially in old roots.

In the young roots and plants, in the yellowish lactescent juice, it is more particularly united to the aqueous extractive substance.

PROPERTIES OF CHELIDONINE.

Chelidonine crystallizes partly in transparent tables, and partly in cubes and their varieties. In the crystalline state it with difficulty dissolves in hot alcohol and ether; it crystallizes in cooling. The concentrated acids, even with the aid of heat, act but slowly on it; nitric acid turns it yellow, and sulphuric acid black. The dilute acids form with it colorless salts, which easily crystallize, and have a very bitter and astringent taste. Chelidonine readily dissolves in the fatty and volatile oils, by means of heat: these solutions have a bitter taste.

The alcoholic solution exerts an alkaline reaction.

If we pour into a solution of acetate of chelidonine, tincture of galls, or basic acetate of lead, abundant white precipitates are produced. Tincture of iodine forms in it a precipitate of the color of kermes. Chromate of potassa precipitates it of a deep yellow color; chloride of gold, yellow, and dark red, the alkalies white, &c.

PROPERTIES OF PIRROPINE.

Pirropine crystallizes in stars, which are prisms united; these crystals are transparent and colorless. By cooling they lose their transparency, and become rather brown. The acids scarcely act on it when cold; by boiling they dissolve it, and assume a golden yellow or reddish color. If its crystals be put in contact with any powerful acid, they immediately acquire a fine fiery red color. These combinations are in great part soluble in cold water, and have a very bitter but sour and pungent taste.

Pirropine with difficulty dissolves in cold ether and alcohol, and easily when they are boiling. Fatty and volatile oils dissolve it when cold. On being heated it melts, burns, and gives rise to ammoniacal vapours. Tincture of iodine precipitates acetate of pirropine of a crimson color; chloride of gold, brown yellow; chromate of potassa, deep yellow; tartar emetic, chloride of iron, nitrate of protoxide of mercury, deuto-chloride of mercury, and nitrate of silver, whitish yellow. The alkalies form in it a white precipitate. Tincture of galls and basic acetate of lead, do not effect any change in it. The alcoholic solution has not an alkaline reaction.

Prior to the year 1824, M. Chevallier, while working in M. Vauquelin's laboratory, discovered the existence of a crystalline substance in the *Chelidonium majus.* This fact he announced to the Société de Pharmacie; at about the same time M. Godefroy also remarked the same thing. "The reason," says M. C., "that I did not continue my investigations on this subject, was, that my colleague, M. Godefroy, had advertised that his work would appear in the spring of 1825. I did not wish to enter into competition with this work; and since, M. G. having died, I lost sight of the subject, which had not been continued by that chemist."

ON THE MANNER IN WHICH ASPARAGIN ACTS UNDER HIGH PRESSURE.*

BY O. L ERDMANN.

MM. Boutron-Charlard and Pelouze† have, as is known, observed the remarkable fact, that asparagin, dissolved in distilled water, is converted into aspartate of ammonia, under the pressure of two or three atmospheres. They indicated only, for the process employed in their experiment, that they used a glass tube sealed at each end, and which was opened *after cooling.* From this it results that the experiment was made at an elevated temperature. Now, M. Erdmann wished to ascertain whether the decomposition was owing to the pressure, or to the elevation of temperature. For this purpose, he used, in operating, at the ordinary temperature, a compressing apparatus, constructed on Œrsted's plan, and which gave a pressure of thirty atmospheres.

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* *Journal für praktische Chemie*, vol. xx. p. 69.

† *Annales de Chimie et de Physique*, vol. lii. p. 101.

Solutions of asparagin in water, of various degrees of concentration, were put in glass tubes, closed at one extremity and open at the other, which were plunged at the open extremity in a vessel containing mercury. The latter was placed in the compressing apparatus filled with water, then the water in it was compressed until the pressimeter indicated a pressure of thirty atmospheres. The tubes remained for several hours subjected to this pressure. After opening the apparatus and removing the tubes, the asparagin was found unaltered; the solution did not precipitate the salts of silver and lead: put in contact with potassa, it did not disengage ammonia, and it gave by evaporation crystals of asparagin, with all its ordinary properties. It appears, therefore, that the conversion of asparagin into aspartate of ammonia, is an effect of heat and not of pressure. The author also made, on this occasion, some researches relative to the influence of pressure on other bodies which easily undergo metameric transformations, or have a composition similar to that of other bodies. In this view, he has made experiments on cyanate of ammonia, urea, grape sugar, cane sugar, starch, and tartaric and paratartaric acid; but none of these substances underwent any perceptible alteration under the pressure of twenty or thirty atmospheres, at the ordinary temperature.

EXAMINATION OF A WATERPROOFING LIQUID.

BY EDWARD BENTLEY,

Fellow of the Microscopical Society of London, and Operative Chemist to H. R. H. the Duke of Cambridge.

1st. It had an acid reaction, but I could not find any free acid.

2nd. No trace of any metallic salt was discoverable by any reagents.

3rd. Large quantities of alum were found in the liquid, which caused the liquid to redden vegetable blues.

4th. No salt of lime could be detected in the fluid, and the ascertained ingredients would preclude any idea of baryta, or strontia.

5th. Small quantities of vegetable matter existed in the liquid, but what that may be I cannot pretend to state from the analysis of the quantity sent.

6th. A white residue remained as a precipitate, which was recognized to be sulphate of lead.

From the above statement a clue may in some degree be found, to the manner in which substances act in rendering cloth waterproof; and, if I might hazard a conjecture, I should imagine that the cloth was first dipped into a solution of acetate of lead, and afterwards into a strong solution of alum; but whether the small quantity of organic matter contributes in any way to the same effect, I am unable to form an opinion; but perhaps its small amount might be considered by some a proof of its not acting any important part in the manufacture of waterproof cloth.

COMPOUNDS FROM INDIGO.†

According to Erdmann, when indigo suspended in water is subjected to the action of chlorine or bromine, several products are formed: when the fluid thus acted upon is distilled, a fluid product in minute quantity passes over with the solution, and collects under the fluid in the form of white scales, which Erdmann terms *chlorindopten.* It is easily melted and dissipated by heat; it resembles an ethereal oil; it is slightly soluble in cold, but more so in hot water. It dissolves in alcohol, and is precipitated from its solution by water. Its composition is $C_8 H_2 Cl_4 O$.

At the bottom of the solution which has been acted upon by chlorine, is found a reddish yellow body: when this is treated with water it dissolves, leaving a resin which may be termed *chloranil resin.* It may be purified when the reddish yellow matter is boiled in alcohol; on cooling, reddish yellow translucid crystals separate: these would appear to consist of two bodies nearly similar in character; the principal distinction lies in their somewhat different solubility in alcohol, and in the one containing twice as much chlorine as the other. They have therefore been termed *chlorisatin* and *bichlorisatin.* With bromine corresponding compounds are formed. Chlorisatin dissolves in potash, and forms a compound of potash and *chlorisatic acid*, the composition of which is $C_{16} H_5 N_2 Cl_2 O_4 + KO$. The acid cannot be isolated, but its atomic weight appears to be 2318. *Bichlorisatic acid* is formed with bichlorisatin and potash. *Chlorisatyd* separates from a solution of *chlorisatin* in hydrosulphuret of ammonia, in the form of a white precipitate. *Bichlorisatyd* is formed in a similar way.

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† *The Athenæum*, September 5.

PETROLEUM OIL WELL.*

About ten years since, whilst boring for salt water, near Burksville, Kentucky, after penetrating through solid rock upwards of two hundred feet, a fountain of pure oil was struck, which was thrown up more than twelve feet above the surface of the earth. Although in quantity somewhat abated after the discharge of the first few minutes, during which it was supposed to emit seventy-five gallons a minute, it still continued to flow for several days successively. The well being on the margin and near the mouth of a small creek emptying into Cumberland river, the oil soon found its way thither, and for a long time covered its surface. Some gentlemen below applied a torch, when the surface of the river blazed, and the flames soon climbed the most elevated cliffs, and scorched the summit of the loftiest trees. It ignites freely, and produces a flame as brilliant as gas. Its qualities were then unknown, but a quantity was barrelled, most of which soon leaked out. It is so penetrating as to be difficult to confine in a wooden vessel, and has so much gas as frequently to burst bottles when filled and tightly corked. Upon exposure to the air it assumes a greenish hue. It is extremely volatile, has a strong, pungent, and indescribable smell, and tastes much like the heart of pitch pine.

For a short time after the discovery, a small quantity of the oil would flow whilst pumping the salt water, which led to the impression that it could always be drawn by pumping. But all subsequent attempts to obtain it, except by a spontaneous flow, have entirely failed. There have been two such flows within the two last years. The last commenced on the 4th of July last, and continued about six weeks, during which time about twenty barrels of oil were obtained. The oil and the salt water, with which it is invariably combined during these flows, are forced up by the gas, above 200 feet, into the pump, and thence through the spout into a covered trough, where the water soon becomes disengaged, and settles at the bottom, whilst the oil is readily skimmed from the surface. A rumbling noise, resembling distant thunder, uniformly attends the flowing of the oil, whilst the gas, which is then visible every day at the top of the pump, leads the passing stranger to inquire whether the well is on fire.

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* From *Silliman's Journal.*

ELATERITE, OR FOSSIL CAOUTCHOUC.

M. Pelouze has ascertained that this substance, which occurs in La Vendée, has the same composition as Indian rubber, viz , $C^8 H^7$.

In this country it is accompanied by a sort of gum resin, which is sometimes red, sometimes yellow, and even greenish ; transparent, insoluble in water, and corresponds in its characters with amber.

CHEMICAL ERRORS.

In our last number we quoted, from *The Athenæum*, a passage in which it is stated that M. Marchand had " refuted the experiments of Dr. G. O. Rees, who affirmed that he had detected titanic acid in the blood, mistaking silica for that acid." We now give, from the same journal, the following letter from Dr. Rees to the editor, with the remarks of the latter upon it :—

" In your paper (No. 667), you have inadvertently done me an injustice. The paragraph I allude to is entitled ' Chemical Errors.' Permit me, Sir, to state, that the existence of titanic acid in the blood, as shown by myself, has been confirmed by the experiments of Brunner, who detected it also in the blood of the dog. It is true, that the subsequent experiments of Marchand afforded him a negative result, and he presumed therefrom that the silica in the blood had been mistaken for titanic acid. This, however, is quite impossible, as may be seen by any chemist sufficiently interested in the question to note the blowpipe re-actions which I published in the *Philosophical Magazine.* You will greatly favour me by inserting this note, as I am unwilling that a positive result, in which two observers agree, should be published as an error, on the single negative experience of M. Marchand, a gentleman who, though his opinion is entitled to great respect, may, very possibly, hereafter have occasion to modify his views.—I am, &c.

" G. O. Rees.

" Guildford-street, August 27."

" It is in the blow-pipe tests that the objection to the conclusion of the writer lies, the characters of the impure silica alluded to before the blow-pipe being almost identical with those of titanic acid. Marchand is not the only observer who has obtained a *negative* result. Berzelius, Thomson, Lecanu, Richardson, O'Shaughnessy, and all other chemists who have examined the blood, agree with Marchand."

II. CHEMICAL MANUFACTURES.

SPECIFICATION OF MR. JOHN AUGUSTUS TULK'S PATENT FOR IMPROVEMENTS IN THE MANUFACTURE OF IRON.

THE following is a detailed description of this invention, which we consider to be of much practical value. The novelty consists in the mode of applying glass, or the materials used in glass-making with hœmatites, and other rich iron ores, to the manufacture of iron in blast furnaces. We use nearly the patentee's own words :—

"According to the ordinary means now resorted to for the manufacture of iron, by smelting iron ores in blast furnaces, the description of ores known as argillaceous ores, are, and ever have been, those which have necessarily been employed, notwithstanding their being exceedingly poor of metallic iron, and it is only from the circumstance of the poverty of such ores, that the process now resorted to, can be worked with advantage in the manufacture of iron, by the use of pit coal, or coke, or anthracite ; and such process of manufacturing iron from argillaceous ores, as now practised, is inapplicable to the making iron in blast furnaces from the rich ores or oxides of iron, known as hœmatites, found in Cumberland and other places ; and such ores have only been used heretofore in the blast furnace, to a very small extent, in conjunction with poor argillaceous ones, and in some cases with the cinder of reverberatory furnaces used in the manufacture of iron. I believe that such rich ores or hœmatites have seldom, if ever, exceeded one-tenth of the ores in the blast furnace at one time ; the quantity, however, may be more. Now, the nature of my invention is such, that iron may be made by the use of a blast furnace, wholly from the rich ores, or hœmatites, or oxides of iron ; or such rich ores may, with greater advantage, be mixed in larger, and indeed in any desired quantities, with argillaceous ores, than could be practised by the means ordinarily pursued in reducing argillaceous ores with slight admixture of hœmatites.

It is well known to iron-masters, in the process of smelting argillaceous ores in blast-furnaces, that lime is used as a flux, and that the result of working, is first, the metallic or cast-iron (carburet of iron) and a glass or slag which is produced by the combination of the lime used as a flux, and the silica and other impurities of the argillaceous ores, and the furnace manager judges by the appearance of the glass slag, whether his furnace is working as he wishes, in order to produce the description and quality of iron he wants to make, and he accordingly applies more or less lime, by which he ensures the conversion of more or less of the ore into carburet of iron, and consequently the silica and the other impurities into glass, and such glass protects the metallic iron from the prejudicial effects of the blast. Now, on an examination or analysis of the rich ores or hœmatites, they will be found to possess a very small proportion of silica or materials for glass-making, consequently unless the requisite quantity of glass for protecting the metallic-iron when separated be obtained from some other source than itself, hœmatites cannot be employed in large quantities, even when mixed with poor argillaceous ores, because those poor ores cannot be advantageously worked if the glass slag produced therefrom be proportionably much reduced from that which now results from the present working, which would be the case, if large quantities of hœmatites were to be used with a given quantity of argillaceous ores.

"My invention consists in employing glass, or materials for glass-making, in proportion to the hœmatites used in a blast-furnace, by which means such rich ores may be reduced with facility and advantage, and the cast-iron or carburet of iron protected by the requisite quantity of glass, and the glass slag obtained in the process may be used over and over again. And I would remark that I do not confine myself to the employment of any particular description of glass or materials for glass-making, in carrying out this my invention, as the same may be varied according to the materials which can be most advantageously obtained in the vicinity of the particular iron-works, where my invention is to be employed : thus nearly pure sand-stone with lime are the materials I have employed, because such sand-stone and lime can conveniently be obtained by me near the works where I have matured my invention, but other materials may be used, such as the slag of glass works, and the glass or slag from the blast-furnaces of iron-works, obtaining such slag or glass as free from sulphur as possible. And I particularly mention these matters, because they have heretofore been treated as refuse matters in the works, and may therefore be had at small cost in comparison with other known materials for glass making."

Having thus stated the nature and object of his invention, the patentee proceeds to describe the means of making cast-iron (carburet of iron) from hœmatites or such like ores, by means of blast-furnaces, as pursued by himself: and he remarks that the ores which he worked with, are those of Cumberland and Ulverston, which are very rich, and on analysis contain in one hundred parts of ore about 67·2 of iron, 28·8 of oxygen, and only about 4·0 silica,—consequently there would be very little glass slag produced by such a quantity of silica, when brought into combination with lime, or other proper material for making glass slag. And it should be stated, that in using more or less rich hœmatite ores, allowance must be made for the quantity of silica and other impurities in the ores, and such is the case in respect to combining the use of hœmatite ores with argillaceous ores, in larger proportions than can now be done, when dependent on the glass slag which will be produced from the silica and other impurities contained in the ores, but such allowance will readily be made in practice, after a little experience, the object being to employ such a quantity of lime or flux, as will convert the whole of the silica into glass, and carry off other impurities, in order to prevent a silicate of iron being formed. In describing the process as pursued by me, I will suppose that the furnace used is an ordinary blast furnace, (and I prefer to employ hot-blast). The glass mixture I have employed for smelting the very rich ores above alluded to is that of ninety-three parts of silica to one hundred and one parts of lime; but I prefer to employ these fused into glass, to using the glass-mixture in the blast-furnace. According to the quality of cast-iron I desire to make, I use more or less of the glass or slag, and I prefer in all cases to use the glass or slag to employing the matters for glass-making separately, before converted into glass; but, as before stated, the glass-slag being once produced from this mixture, it may be used over and over again, the workman judging by the appearance of the slag, and applying lime as heretofore. In charging the furnace I first throw in the coke, or coal, or anthracite, as usual, and then the glass or slag materials for glass-making is thrown in; then again the coke, and then the hœmatites or such like ores, broken small to about the size of hens' eggs, then more coke, &c., in this process for a given yield of iron to that employed in reducing argillaceous ores. In charging the furnace wholly with hœmatites and with glass slag, I use about one part by weight of hœmatites to two parts by weight of glass slag, and if there be much silica in the hœmatites, I mix therewith some lime sufficient to convert the silex into glass, and carry off the other impurities. And it will be evident that as the hœmatites contain more silica, and will consequently produce more glass from itself, the glass slag supplied into the furnace is to be reduced in proportion: the furnace in other respects is to be worked as heretofore practised.

The patentee says, in conclusion,—"Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that what I claim is the mode herein described, of applying glass, or the materials of glass making, with hœmatites, or such like rich iron ores, in the manufacture of iron, so as to make such ores applicable to the making of iron in a blast furnace in a manner not hitherto practised."

ARTIFICIAL PREPARATION OF SUGAR.

1. Sugar similar to that of grapes may be prepared by boiling one part of the starch of potatoes or flour, with from 1-100 to 1-10 of sulphuric acid, and four parts of water, for 36 or 40 hours, care being taken to renew the water as it evaporates. At a higher pressure and temperature, the change may be effected more rapidly with a smaller quantity of acid. The excess of acid is then to be saturated with lime, the sulphate of lime separated, and the liquid concentrated by evaporation.

2. The starch of flour soon loses its gelatinous consistence, when moistened with an extract of sprouted barley; it is transformed into a liquid, and if the barley is in sufficient quantity it is changed in the course of a few hours into sugar of grapes, provided the temperature be maintained at 158° to 167°. Six parts of barley which has germinated, produce 25 parts of sugar of grapes.

3. Grape sugar may also be prepared from wood sawings; it may also be procured by taking 12 parts of linen rags, or paper cut into small pieces, mixing them intimately and gradually with 17 parts of concentrated sulphuric acid, or with five parts of sulphuric acid, and one part of water; the temperature must be kept moderate. After 24 hours, the mass is to be dissolved in a quantity of water, and boiled for ten hours; it is then to be neutralized with chalk, filtered and evaporated to the consistence of syrup, and crystallized.

Chemists have not yet been able to obtain sugar prepared by these artificial methods in regular crystals like cane sugar, although there is little doubt that these two species differ from each other merely in the quantity of water with which they are combined.

NEW PROCESS FOR MAKING SULPHURIC ACID.[*]

BY M. PROVOSTAYE.

This chemist has proposed the following process :—He recommends introducing into the leaden chamber, sulphuric acid, and the vapor of water. To understand what takes place under these circumstances, a current of sulphurous acid may be passed into a flask containing nitric acid : this should be made, by means of a bent tube, to communicate successively with a flask containing sulphuric acid, a globular vessel moistened with water, and a dry globe. The nitric acid is completely decomposed. The first flask contains pure sulphuric acid alone. Red vapors pass from the first vessel into the second ; this is filled with sulphurous acid also, for it is formed of solid white crystals, in the two last experiments as in the first. In the latter, all the sulphuric acid of the second flask exists in a solid crystallized mass, of a greenish yellow color. There actions are, therefore, similar to those of the old process. In the new process, the nitric acid yields a portion of its oxygen to the sulphurous acid, in order to convert it into sulphuric acid. Hyponitric acid is thus formed, which acts like the hyponitric acid in the old process, which is formed from the binoxide of azote and oxygen of the atmosphere : that is to say, successively it yields oxygen to the sulphurous acid, and borrows it from the air ; but the discharge requires the intervention of sulphuric acid and water. The water has two very distinct functions : it acts directly, by bringing into more intimate contact the sulphurous acid and hyponitric acid, and this favors the oxidation of the first by the oxygen of the second ; it acts also by decomposing the white crystals immediately, and changing them into sulphuric acid and oxide of azote.

NITRATE OF SODA AS MANURE.[†]

This has been advantageously applied to produce a most luxuriant and abundant aftermath. It was applied after the hay crop was gathered, in quantity about as much as if you were sowing oats ; in ten days, a large green mass of vegetation had sprung up four inches high, producing a far greater mass of vegetation than the same field produced in the spring of the year, although the meadow had received a good coating of stalk dung and soil. The application of the nitrate of soda now spoken of, took place in the recent hot weather, and never had a shower of rain upon it during the ten days —every morning there appeared to be a heavy dew upon this part of the meadow, when on the other parts none was apparent. The appearance of this part of the land has a great contrast with the other aftermath, the grass of which is universally low, wiry, and spindling. It might be concluded, had the hay harvest been earlier, a second crop might have been obtained better than the first ; it is certain that this aftermath is far superior to the first crop. The grass ominously called squitch grass, is scarcely apparent it ; whilst in the rib grass and other herbaceous grasses are most abundant, and very luxuriant.

As nitrate of soda is very apt to absorb moisture from the atmosphere, agriculturists would do well, in purchasing it, to see that they have it well dried, otherwise they would pay a large proportion for water ; it should be purchased by a broker from the importer, of a certain refraction, as great gain will be thus insured in obtaining the article.

There can be no question, that in producing hay crops, it would prove the most advantageous manure that can be applied ; and without impoverishing the ground, two crops of hay may be annually obtained. This experiment was made upon a very ordinary meadow, and upon the worst part of it ; under all the plans of cultivation to which the meadow has been subjected, none has ever succeeded so well, either in quantity or quality of the grass. The experiment may be easily tried at the present time of the year, by any agriculturist—any grassplot gives an opportunity for the like purpose.

From examples so simply tried, proof sufficient may be made to cause the nitrate of soda to become universally used, for the purpose of a cheap and highly productive manure.

NEW MODE OF PREPARING LEATHER.

We have been favoured by Mr. Grundy, of St. Martin's-lane, with a sample of leather, prepared, as we are informed, by an entirely new chemical process, by which it is rendered very soft and much more pliable than leather prepared by the old process, and calculated, in our opinion, to be far more durable.

MODE OF PRESERVING ANIMALS.[‡]

M. Salomon directs, for this purpose, that reptiles especially be immersed for two months in strong alcohol, and then placed in a stove, heated to 104°, until they are completely dried.

After this preparation, they may be kept for any length of time without exhaling any disagreeable odour.

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[*] *Inventor's Advocate*, Sept. 5.

[†] Ibid

[‡] From *The Athenæum*, August 29.

III. PHARMACY, &c.

MEDICAL REFORM, EDUCATIONAL AND PRACTICAL.

BY CHARLES WATT.

Gladly indeed would we hail the introduction of any measure of reform having for its object the advancement of the General Practitioner in knowledge, usefulness, and public estimation; every aid we could command should unceasingly be devoted to ensuring the success of those engaged upon so laudable a work. But when we see that, instead of looking to themselves for correction—instead of using all their influence to establish a better system of teaching the different branches of the sciences connected with medicine, thereby ensuring a more perfect education, and enforcing a more rigid examination into their acquirements and qualification—they truckle to the legislature to elevate them by enactments, and to grant them an unwarrantable power of still farther encroaching on the other ranks of practitioners,—we feel called upon to make some remarks in justice to the latter.

So long as the profession is not consolidated into one, as it is in the lower rank, namely, the surgeon-apothecary, the two branches which now exclusively exercise the functions either of Medicine or Surgery must of necessity hold the higher station in society, and, however odious the name of "apothecary" may be to those, *qui gaudent nomine*, they will ever have to bear it and its concomitant degradation.

To each class—Physician, Surgeon, and Apothecary, custom has assigned their relative rank, and this can never be changed by legislative interference, unless the two higher ones are degraded in order to abolish the distinction.

Medicine is a profession concerning which every one clings to his own particular prejudices, deeming himself competent to judge of the fittest person to attend him: to real qualification he pays very little attention. Hence we can readily account for the reason why mere shop-boys having been crammed so as just to enable them barely to articulate a quantum of medical "hotch-potch" at Asafetida Hall, may then exercise with impunity their dignified calling with mystified bombast and disguised ignorance, thus unworthily assuming the duties and encroaching upon the rights of the Physician, the Surgeon, and the Chemist, combining at the same time the incongruous mixture of "Professional Gentleman," and "Tradesman," while, in truth, their education unfits them for either.

It will not be astonishing to our readers, when they reflect on the origin and education, both classical and professional,* of such a person, that, for the sake of acquiring wealth, he should use those little arts (so totally repugnant to the man of science and gentlemanly demeanour) by which he may win the kind favors of the fairer part of creation, from the infant to the old maid or dowager. He is to be found at chapel with the serious, and at "an innocent game of cards" with the more free; he is "all things to all men," aye, and women too;—the intermeddler in every family affair—the depository of every secret. This little creature subserves the purposes of the familiar friend, carrying from house to house all the scandal and gossip suited to his taste and small capacity, until he has conveyed from one to another, throughout the whole precincts of his abode, the affairs of every one of his patients as "most profound secrets," and has so fixed himself in the confidence of each, that it is next to impossible to get rid of

> "This flimsy thing, whose only use is
> To retail scandal and abuses,
> Who knows of physic just as much
> As mother Eve did of High Dutch."†

With such a thing as this at one end of the profession, and a Harvey, a Hunter, an Abernethy, or a Lawrence at the other, little is to be hoped for, except from education: legal enactments never can raise the one, nor can they level the other, to a common rank.

Yet is it this very man who is crying out for medical reform as regards *payment*, and the privileges of Chemists. That he is the party who most needs reform we very readily admit; and if he begins at home he will have too much to employ him to be able to think of others, he will no longer have to cast reflections on Chemists, and will cease to appeal to that popular organ of his peculiar class, *The Lancet*, to uphold his dignity, and denounce, as "IGNORANT chemists and pretenders," those who, when asked, venture to prescribe to their customers such *simple* remedy as may be suited to any trifling ailment, even though it may be to prevent error.

Taking the general run of Apothecaries, they are *indeed finely* qualified to sit in judgment on others! the greater part of them are sad compounds of ignorance, conceit, and arrogance, and this is not better illustrated than in the circumstance of such eternal occurrence as the publication of cases. An insulated case, forming a perfect anomaly, and a total exception to every rule, and from which no inference can be drawn on which to found any general line of practice, is noted with the greatest gravity, and, after some six months' parturition, is delivered into *The Lancet*. Thus we have Mr. Shaw's case, Dr. Davis's case, Mr. North's case, &c., &c., &c. It may be, some girl is fool enough to get a pin into her ear, and there it remains for six months, when at last—of course, after *great trouble*—the attendant gets the head, and then, after two or three days, he gets the tail, as in this little instrument there is nothing else to take.

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* It is difficult to say which he most lacks.

† Old Medical Poem.

The patient takes a draught, prescribed in Latin, which would make the village pedagogue blush. She is reported, consequently, to have done this, that, or the other, rightly. Takes something else—is not so well to-night is seen again (unless she is an HOSPITAL OR POOR-LAW patient, and if so, has had some such important mishap as a *sacro-ischiatic rupture*), takes some other nostrum, and, like the termination of a novel, or rather a farce, the result is favorable, the fame of the practitioner is stamped, and all the ladies, particularly the old ones, who are his patients, look with astonishment at the skill of their adviser, and bless their own good luck in making such a choice.

We are very far from setting any very high value on the powers of the medical profession generally; on the contrary, we are of opinion, and we utter it with inexpressible sorrow, but with the deepest conviction of its humiliating truth,—that if the whole profession were suspended for three years, the bills of mortality would be considerably decreased! for with the small exception of operations in surgery, and obstetrical assistance, the sad ignorance which prevails in the more abstruse departments of medicine, and the meddling officiousness of those who pay themselves by drenching their victims, are the causes of incalculable injury to, and the destruction of, those organs on which their baneful nostrums operate!

We next proceed to inquire what is the kind of reform these gentlemen are seeking at the hands of the legislature. This is easily stated. Their chief objects are to obtain legal right to take fees, and to prevent chemists from prescribing. Now, it is quite clear that if they are permitted to charge for time and attendance, by fees, that they ought not to take the chemists' rights also, and be suffered to charge for medicine at the same rate as they now exact, neither ought they to have the privilege of making up prescriptions. We would ask them why they should expect to have the right of exercising the four branches of the profession. namely, medicine, surgery, midwifery, and pharmacy, and to exclude chemists wholly from every one of these, except the latter? We would also ask, which of the classes is the greater encroacher on the rights of his brethren? The physician sometimes practises midwifery, the surgeon never; but the general practitioner not only practises all these, except operations in which no one will trust him, but he is a chemist also, dispensing prescriptions and selling by retail.

We would here observe, that with regard to the apothecary, there is no sufficient guarantee to the public as to his acquirements; whereas, with respect to the physician and surgeon, there is the college education of the one, and the engagement at public institutions of the other. We advise the Members of the College of Surgeons to put M.R.C.S. after their names, on their doors and cards.

Little, indeed, can these gentlemen boast of their exertions to advance medical science. Until within the last forty years, the grossest ignorance prevailed in their prescriptions and mode of compounding chemical substances. It is really melancholy to reflect on the sad fact, that while the immortal Hunter was enlightening the dark paths of physiological and pathological science with his discoveries, it is within the memory of the writer that this branch of the profession still retained in their shops the articles of "the powder of crabs' eyes," the "powder of dead mens' skulls," and "album græcum."

We trust we have said enough to convince every one that this class of practitioners has nothing to expect from legislative aid.

We would advise chemists to acquire more knowledge, and to watch any measure brought into parliament, in order to prevent the passing of any bill prohibiting them from practice. For this purpose an Association, to which we beg to solicit the assistance of our readers, is being formed to take proper means, and to raise a fund to meet any contingencies required for the maintenance of the rights of chemists and druggists. We see no reason why there should not be a chemist-apothecary as well as surgeon-apothecary.

Our own opinion concerning the division of the medical profession is, that if the middle rank is allowed to practise the several departments of medicine, surgery and midwifery, chemists should be allowed, of course if qualified, to practise pharmacy, to visit out-door patients, and to dispense prescriptions. We are quite certain that when required, the qualifications of these gentlemen will equal, if not excel, those of the former.

That there are far fewer mistakes, and that these are even less serious, committed by chemists, than by the apothecaries, we are convinced. It is only very lately that one of the latter class, getting up to serve an ounce of tincture of rhubarb, gave the same quantity of tincture of opium in mistake, and the woman who took it, and who, fortunately under proper treatment at the hospital, recovered, is yet so ill as to leave no hope of her lasting the ordinary time.

We have lately seen a prescription of a surgeon in good practice, near St. Paul's, which is composed of compound spirits of ammonia and elixir of vitriol.

We would advise our brethren, the chemists, to receive instruction in medicine, pharmacy, and chemistry, if they do not wish to attend to anatomy,—this will give them a sufficient knowledge to protect them against the imputation of ignorance, and from being held up as objects of caution by the general practitioners and *The Lancet*.

Let us now take a view of the education and acquirements of the greater part of "general practitioners," and their mode of obtaining them. In classical acquirements, with very few exceptions, there is not one who could translate the first line in Eutropius, or repeat the first page of the Eton Latin Grammar; Greek is to them "a sealed book." If they can manage to get by rote a few pages of Celsus, which, from its subject being so closely connected with medicine, it is easy to remember, after a few drillings with a translation, they are quite satisfied of possessing a sufficient stock of Latin.

Their introduction to the study of their profession is through the medium of apprenticeship, a barbarous relic of bygone times, when the sciences were linked with the haberdashers and saddlers of Guildhall, and taught by the freemen of the civic companies under the appropriate appellation of "arts and mysteries,"—terms which seem to indicate their connection with occult science and alchemy.*

Under the guidance of such parties as those to whom they serve their time of five or more years' slavery, what kind of instruction do they generally obtain? In most cases they are employed more in the capacities of domestics than in that of pupils in science. (This is the case more especially in the country.) When the time has expired, they are found to have learned the art of dispensing medicine, and to have seen a few cases. of which latter they know as much of the history and indications of cure as of algebra.†

The next step is to walk the hospitals, as it is termed, and the term is not inappropriate; for the students may be seen walking up and down at all hours, looking at the women, and in the neighbourhood of each place that should be especially dedicated to the acquisition of science, they are marked as a thorough nuisance: it is with regret that we announce the incontrovertible truth, that the general conduct of medical students is more disgraceful than that of any other class of persons who are destined for the study of that kind of knowledge which constitutes the profession of gentlemen. Earnestly do we call the attention of the professors to this disgraceful fact, and exhort the pupils to such deportment as shall in future repudiate such a stigma.

The system of education which during the present session we shall establish, will at once put a stop to all such conduct, and enhance the respectability of the profession. We here give a brief exposition of it:—

The first portion of the method is, to divide each subject into classes (taking, for example, Anatomy, as it is given in the sequel), and again to subdivide these classes as minutely as possible.

The next step is, to have a set of printed charts or cards containing just as much matter as can well and easily be acquired each day; allowing, at the same time, for the other studies which belong to professional education; the amount of matter on each day's chart being regulated by the whole number required for the course of anatomy. This chart being learnt by the time at which the class meets again, the pupils will be required individually to repeat to the examiner appointed, and to demonstrate all the parts and circumstances connected with each particular point, on the bone or recent subject, the dry or moist preparation, as the case may be. If the pupil thoroughly know it, he delivers up his chart, and receives another; if not, he keeps it another day; and if his deficiencies are but few. he may receive another, but never more than two.

The office of daily examination is to be deputed to the pupils in turn: so that each is made to demonstrate. Thus, while he is himself learning, he is made to assist others less advanced; and by this means is maintained a regular system of reciprocal teaching and learning.

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* They have ceased to be any longer the disciples of alchemy; but from the occult sciences they have by no means separated, so far as their advancement in medical science is concerned.

† We are aware that many medical students go to the hospitals once a week to put down their names for the past week, in the book kept for the purpose of seeing who does and who does not attend. One student who was in the habit of doing so was accosted by the lecturer, whom he did not know personally, and was thus detected.

At each daily course of instruction, however, the professor is to be present; and, on his daily inspection, he will have a perfect knowledge of the proficiency or inattention of every pupil committed to his care, and will thus be enabled to encourage the one, and correct the other.

The business of the daily examiner is to put the word "Absent" against the name of such pupils as do not attend; to see that none of the daily charts are undelivered; and to enter all that are not delivered at the daily attendance. The examiner is also to record in a book the progress of each pupil; and, if he have made no more than two omissions, to state these, in order next day to see if they are then known to the pupil.

At the time of delivering the charts or cards, the person who is entrusted with this office is, if the subject be anatomical, to demonstrate all that each card contains, on the natural parts. If it be a subject of chemistry, he is to illustrate the facts by experiments, and to explain all relating to them. In the medical and surgical departments, it will be the duty of the teacher, on each succeeding day, to deliver to the pupils of each class, the history and treatment of the accidents which befal those parts, and the diseases which affect those functions, the knowledge of which they have previously acquired. This is all the lecturing admissible into this system of teaching.

When the pupils of any class have acquired the knowledge which is its object (of the bones for instance), they enter another class (that whose object is the ligaments), and so pass on, until they complete the whole of the classes in the course of instruction; at which period they receive from the professor a certificate of attention and proficiency, in order to entitle them to appear before the public examiner, whose duty it is to act between the candidate and the public, as the judge of the one, and the conservator of the interests of the other.

On the Saturday of each week it will be the duty of the demonstrator of the day, assisted by others (for as already said, one will be appointed for each day), to make recapitulatory examinations of the pupils, as to their knowledge of the week's business, to render up to the professors an account of each pupil's progress, as recorded in the book which is kept for such purpose, and which contains an account of the mistakes made by each pupil in his examinations. If they exceed more than two or three in each day, or by their frequent recurrence evince a want of due attention and perseverance, the pupil must either employ additional time to keep pace with the class, or he must suffer degradation.

To such a method of teaching none will hesitate to submit, except those who, under the present one, would avail themselves to the utmost of the opportunity it affords for inattention and idleness. It is, therefore, for these especially, that such a check is requisite. By the assiduous and steady pupil, it will be hailed as a boon; while the careless one, on the contrary, will be made to feel that he cannot trifle or neglect with impunity, or without detection and remonstrance.

Those medical students who come from distant parts of the country, seem to imagine, that to get rid of their plough-tail rusticity, they have only to get the assistance of a London tailor, to be at once mistaken for the refined gentleman,—that they have only to imitate every imperial-chinned, moustachio-muzzled puppy, not only in fuming segars and in drinking, but in the highest metropolitan refinement of the most degrading profligacy and beastly licentiousness, following him into all his dens of folly and vice.

We earnestly repeat our exhortation to them to get a far more competent knowledge of medical science, and to look to their own individual attainments for honors and advancement; and, while they are importuning parliament for acts to secure their mode of gain, to bear in mind the advice of Solomon, "with all thy getting, get UNDERSTANDING."

MEMOIR ON THE MEANS TO BE ADOPTED FOR DETECTING CUPREOUS PREPARATIONS CONTAINED IN THE HUMAN BODY AFTER POISONING, AND OF DISTINGUISHING THEM FROM THE COPPER NATURALLY EXISTING IN MAN.

BY M. ORFILA.

Our readers are aware that in former Memoirs (for which see "The Chemist," No. I., 2d edition, p. 15, and No. V., p. 153), M. Orfila endeavoured to prove that the soluble preparations of arsenic and antimony introduced, during life, into the stomach, the rectum and the cellular tissue of man and the dog, were absorbed, and that it was to this absorption that the poisoning was attributable. It remained for chemistry to seek, in the organs situated at a distance from the part where the poison had been deposited, the material demonstration of this absorption—the poisonous substance itself; this difficult task has happily been accomplished, and tartar emetic deposited in the stomach has been detected in the blood, the vital organs, and the urine. M. Orfila analysed the urine of some patients to whom MM. Dumeril and Bouvier had administered large doses of emetic, and he proved the presence of antimony in that liquid. A woman to whom M. Bouvier had given five centigrammes of emetic, and who died fifteen hours afterwards, without vomiting, had antimony in her liver and spleen.

It is the same with soluble cupreous preparations, as with arsenical and antimonial ones; they are absorbed, when taken into the stomach, into the rectum and into the cellular tissue, during life: from very recent chemical investigations, showing that the human tissues in the normal state contain a certain quantity of copper absorbed during life, (see *The Chemist*, No. VIII, p. 251), which naturally exist in the tissues, it would be impossible to decide on a medico-legal report announcing the presence of that metal in the body of a poisoned man: M. Orfila thinks he has found the means of overcoming this difficulty. Moreover, the living tissues are after death subject to the laws of imbibition. It might, therefore, happen that, by a refinement of villany, a malefactor might deposit a cupreous solution in some part of a man who had died a natural death, in order afterwards to accuse an innocent person of murder, and that, by chemical means, the poison might be detected in the organs to which it might be drawn by imbibition. The object of the three sections of this Memoir is to elucidate these three very serious questions, for they particularly relate to the honour and lives of men.

I. The soluble salts of copper, deposited in the stomach, rectum, and cellular tissue are absorbed during life. Before coming at the proof of this proposition, M. Orfila wished to ascertain the best process by which the cupreous salts, mixed with organic substances, might be discovered. We may say that the following is the result of numerous and very various experiments, which alone, in such a matter, can give weight to assertions.

1st. Of all organic matters, albumen forms with the acetate and the sulphate of copper, the most insoluble compound: however, prolonged boiling in a large quantity of water removes from this mixture a small quantity of cupreous salt.

2nd. Long boiling in water separates the cupreous solutions from the food with which they are mixed:

3rd and 4th. As the organic matters present an obstacle to the precipitation of the copper on a sheet of iron, before this precipitation can be effected, they must be destroyed:

5th. The sheet of iron is as sensible a test as prussiate of iron for detecting the least traces of copper, provided that one has the patience to wait an hour for the effect, and provided that the solution acted on be very concentrated. A sixteenth of a drop of a cupreous solution may be detected in a gramme of water:

6th. The incineration of the animal matters containing traces of copper, with nitrate of potassa, permits the smallest proportion of that metal to be discovered.

In order to prove that copper is absorbed, many dogs have been poisoned; some have been killed and others left to the virulent effects of the poison. By subjecting to a prolonged boiling, the liver, spleen, kidneys, lungs and heart of these animals, portions of copper were found in all these organs; in some death was owing only to the poison, and the organs were not submitted to experiment until long after death; in others, almost immediately after. Some were killed soon after being poisoned, and their organs were subjected to analysis: the results were the same. M. Orfila concludes:—1st, That in dogs poisoned with sulphate or acetate of copper introduced into the stomach, copper is found in the liver, spleen, heart, kidneys and lungs, on those organs being submitted to a long boiling in water: 2nd, That the same results are also probable with man.

II.—This section is intended to prove that the copper obtained by the preceding preparation, namely, by long boiling of the organs, is not that naturally existing: the presence of copper in the living tissues of man and the dog, is actually a fact incontrovertibly proved. Vauquelin was the first who made mention of the presence of copper in incinerated blood; but, as he operated in a copper vessel, the presence of that metal in the ashes of the blood was attributed to that circumstance. Gahn had already announced the presence of copper in vegetable and animal tissues, when M. Bouchardat in 1837, and M. Duvergie in 1838, again supported these experiments with their authority. In order to distinguish natural copper, if it may be so called, from copper which has caused poisoning, M. Orfila availed himself of the following experiment: he submitted the organs of man and the dog, for six hours, to boiling in water, incinerated these organs with nitric acid, then treated the residue with water, and never detected an atom of copper. Now, we have seen that in poisoned dogs, the organs, treated in the same manner, always gave evident traces of copper: normal copper, on the contrary, is obtained by incinerating the carbon of the organs.

Boiling water does not dissolve half the copper furnished by poisoning to the organs; for, when this first quantity has been removed by the water, incineration gives more considerable quantities of copper than there would have been without poisoning.

III.—It may be believed that the copper found in the organs of poisoned animals might be brought there from one to another, by imbibition, as some physiologists assert, during life, and as is incontestable after death.

Imbibition during life is demonstrated by the following experiment:—

Completely isolate a vessel,—a large vein is preferable,—and tie it above and below by two ligatures for a certain portion of its length: then rub it with a soluble poisonous substance. The animal on which the experiment is tried will be poisoned. Now, here it must be imbibition that carries the poison beyond the isolated portion of the vessel. This point once freed, the poison is immediately absorbed. Science is indebted to MM. Magendie and Fodéré for these facts. In the living body, imbibition is rapid; in the corpse, no one can deny it, it has not the same rapidity. If persulphate of iron be injected by the œsophagus into the stomach of a dead subject, and if, some time afterwards, the external surface of that viscus be touched with a solution of prussiate of potassa, the color renders the imbibition manifest. In his investigations, M. Orfila set about ascertaining the rapidity of *post mortem* imbibition. 38 grammes of sulphate of copper, dissolved in 120 of water, were injected into the stomach of a corpse, the body was opened eight days after; the temperature had been maintained at from 8° to 20° C.—all the stomach was blue, the surrounding organs were partially so, in those points only which had been in contact with the stomach, whose great cul-de-sac had imbibed most; the salt had perfectly traversed the liver, and had arrived at the base of the right lung, which also was bluish or greenish; all the points whose color was changed and produced by the cupreous solution, gave by boiling water, a great quantity of copper: all the portions of organs whose color was normal, and which had not imbibed anything, gave no copper by the same process. Thus, every portion of the subject put in contact with a soluble cupreous preparation takes a bluish or greenish tint, which denotes the presence of copper. The tissues near the point where the salt has been deposited may imbibe some of it; but they are colored and contain it in those places only.

A hand and an arm, covered with skin, steeped for ten days in a concentrated solution of copper, did not present, at the internal surface of the skin, any trace of copper, even when the epidermis was removed; the skin itself contained in its interior traces of that metal. This experiment shows that the skin is a great obstacle to imbibition, and supposing a subject was deposited in a very cupreous soil, a long time and a great quantity of the salts would be required that the copper might be transported into the centre of the organs, if the corpse were not that of a poisoned person.

GENERAL CONCLUSIONS.

From the preceding experiments and considerations, it results:—

1st. That acetate and sulphate of copper, introduced into the stomach or applied to the sub-cutaneous cellular tissue of living dogs, are absorbed and carried into all the organs of the animal economy.

2nd. That, probably, it is the same with man.

3rd. That it is possible, by aid of certain chemical processes, to extract metallic copper from that portion of these salts which has been absorbed.

4th. That it becomes indispensable to recur to this extraction when these poisons have not been found in the digestive canal, or in the other parts to which they have been immediately applied, or in the vomited matters; for by limiting, as has hitherto been done, the search for cupreous salts in the matters proceeding from the stomach and intestines, there is a risk of not discovering them, either because they no longer remain in the digestive tube, or because the vomited matters have been withdrawn, whilst the metal may always be obtained from the absorbed portion.

5th. That a Medico-legal report should be declared INCOMPLETE and INSUFFICIENT from the fact *that in the case indicated*, the search for cupreous salts in the parts where they exist after having been absorbed shall have been omitted.

6th. That independent of the cupreous salts absorbed during life, and which are found unequally disseminated in *all the tissues*, many of our organs, and especially the abdominal viscera, if the salts have been introduced into the digestive canal, also contain, especially at that part of their surface which was in contact with that canal, the portion of those salts which has come to them by *post mortem* imbibition, and whose quantity varies according to the period at which the bodies were opened; that, from that time, the copper procured as the last result from these organs, arises at once both from the salt which had been absorbed, and from that which had traversed the tissues after death.

7th. That the imbibition in question, put beyond doubt by the experiments of Fodéré, Collard, Martigny, Magendie, &c., and by M. Orfila, is a phenomenon which does not exclusively belong to poisoning by copper, since it has been observed *in all poisonings* in which the poisonous substance, incompletely absorbed during life, after death remains in our tissues, provided that this substance be in solution or susceptible of being dissolved in the liquid with which it is in contact; thus that which has just been said relative to the proportion of cupreous poison furnished by the viscera, either through absorption or imbibition, is applicable to all those kinds of poisoning in which the poisons have been absorbed.

8th, That it is possible, in most cases, to determine whether the salts of copper and other poisons procured from the viscera, in medico-legal investigations, were administered *during life* or *after death*, either in respect to the symptoms previous to death and the lesions of the tissue, which have been proved at the opening of the bodies, or by aid of chemical experiments tried on such an organ situated at a distance from the digestive canal rather than on one near to it, or on such a part of the same viscera in preference to such another; that, indeed, in some very rare cases, as after a long inhumation, and when there remains nothing but the *detritus* of the viscera, the problem in question might be less easily resolved, if the information collected by the magistrates did not tend to enlighten the operator by *positively* establishing that the poison had not been introduced into the digestive canal after death. However, judicial annals do not present any instance of malice being carried so far as injecting a poisonous substance into the digestive canal of a corpse.

9th. That the cupreous salts which have caused poisoning may be detected, by boiling, for an hour, with distilled water, the various viscera and the flesh, drying the filtered decoction, and carbonising it by nitric acid, or by decomposing it with nitrate of potassa.

10th. That even at the expiration of six hours, by the aid of boiling water, the whole of the absorbed cupreous salt is not dissolved, but that sufficient to put its existence beyond doubt may be extracted.

11th. That distilled water, after an hour's boiling, did not dissolve a single trace of the *normal copper* contained in our tissues; that it can only be partially separated by the concentrated acids, and wholly, by incineration, so that a jury should conclude that a cupreous preparation has really been taken during life, either as a poison or as a medicine, if copper be obtained from an aqueous decoction by boiling for an hour, with distilled water, the viscera or muscles of an individual suspected to have been poisoned, unless it be proved only that this cupreous preparation arrived in the organs in consequence of a *post mortem* imbibition.

12th. That it is preferable at first to subject to aqueous boiling the viscera of the digestive canal, than the portions of the abdominal organ which have not been touched by this canal, and afterwards to act on the portions which have been in contact with the stomach and intestines: by operating thus there is a certainty of constantly obtaining a greater quantity of poison from these last, and of collecting information calculated to facilitate the solution of the questions which it may be tried to raise as to imbibition.

13th. That if medico-legal investigations, instead of being extended to the organs, were limited to the alimentary or excrementitious matters contained in the digestive canal or the vomited liquids, these matters should be boiled for an hour, with distilled water; the liquor must be filtered and dried, and then decomposed by nitric acid, or by nitrate of potassa, very free from copper; the presence of that metal in the product thus formed permits it to be affirmed that a cupreous preparation has been taken as a poison, or as a medicine, — at least that it has not been injected after death into the digestive canal. Although the cupreous salts intimately combined with organic matters only very partially dissolve in boiling water, the solution, as we have already said, contains sufficient metal for a sheet of iron to extract it.

14th. That if, after having treated these alimentary or excrementitious matters by boiling water, no copper had been found, it would be wrong to subject them to the action of the strong acids, or to incineration, in the hope of discovering copper which had poisoned, because, even supposing that it be obtained, it could not be concluded that it arose from a cupreous salt having been ingested as a poison or as a medicine, whilst many substances contain normal copper capable of being detected by incineration. It is therefore better not to look for copper in these alimentary matters, but to submit to the action of boiling water, the digestive canal, the liver, the spleen, the kidneys, &c., as we have already said.

15th. That, quite admitting with M. Devergie that the quantity of normal copper contained in the intestines of a grown up man or woman does not exceed 46 milligrammes, I cannot admit with him that it is important to take this proportion into consideration in order to decide, by aid of incineration, whether the copper obtained is or is not normal copper, because, as he himself says, the quantities of normal copper found in the few experiments which he made, are too variable for the indicated cypher to be accurate, and especially because it may happen every day that after poisoning by a cupreous salt, so little of it might remain in the intestines, that by adding the weight of the copper thus furnished, that which naturally existed in those viscera, only 40 or 50 milligrammes might be obtained. That we might take into consideration the proportion of copper yielded by incineration, when this proportion far exceeds that which the latest and most numerous experiments indicated as being really the maximum of normal copper; but that, even in this case, it is infinitely preferable to adopt the means which I propose, because it furnishes clear and accurate results. In conclusion, *the* COPPER *of* POISONING *may be partially extracted from the organs which are boiled for an hour in water, whilst* NOT AN ATOM *of* NORMAL COPPER *can be extracted by this process.*

SYSTEM OF QUACKERY AND ITS EVILS.—PROPOSED REMEDY.

To the Editors of the Chemist.

Gentlemen,—It grieves me beyond measure to think how far the system of QUACKERY is carried, in these would-be enlightened times. One would suppose the improved system of education to be somewhat of a guarantee that the people would possess sufficient *common sense*, to enable them to close their eyes upon the gross absurdities which come daily before them. But the REVERSE is the case. Nor do I think the medical practitioner or the chemist to be the least injured by the glaring and incongruous advertisements which so continually throng our newspapers. Nay, it not unfrequently happens, that the very individual from whom emanates some famous panacea, sets up his claim as belonging to that profession which he is attempting to undermine. For what need would we have for doctors, did their combination fulfil the many wonders recorded of them? That any new "*patent*," brought out with enough of effrontery, takes, is self evident from the numbers which start up around us, productive of some notoriety and an extensive sale, until the novelty is past, and then the miraculous "wonder working" compound sinks into oblivion, and is laid upon the shelf, until again brought forward with some new title, a more gorgeous exterior, and the addition of some extraordinary cures.

We have had some ludicrous occurrences in this particular way—annoying, I mean, when detached from moral feeling. A man brings out a new remedy, takes a house, vends his medicines, obtains a trade, makes some money, falls behind in his payments, pleads poverty, and—dies. But behold him, in another street of your great city, under a different name, but having a fine house, and *not* the same human being, who, a few weeks ago, was a miserable abject bankrupt, whose constitution was so shattered by misfortune, that he perished from—a broken heart. This then is what I would term the aristocracy of quackery,—and may mention, that this particular instance is neither overdrawn nor fictitious, as I have reason to know it *practically*. But this high walk requires much ingenuity in the performance.

Let us only cast our eyes over the newspapers, and we shall certainly meet with something combining in itself all the virtues possessed by the different articles included under our list of Materia Medica. Here we have the express declaration of a *medical man*, recommending some deleterious compound to whiten the teeth by destroying the enamel—nature's protector,—"that it is both *absurd* and *dangerous* to brush the teeth;" and there we have an intimation that "life may be prolonged and youth renewed." The former, to judge from his statement, would eschew ablution in any form, and condemn the removal of *filth* as *obnoxious* and *dangerous;* while the latter has no doubt discovered, what our fathers so eagerly sought after, the "Elixir Vitæ." It needs not that I should enumerate more. I only regret that such glaring and impudent attempts at swindling so frequently succeed. We have instances of men even amassing great wealth by their presumption. Look at the *single R* Morison, who, by introducing a modification, and a wretched bad one, of the Pilul. Cambog. Co., has become celebrated as a powerful magician who cures all diseases by one *simple vegetable agent.* We have also Holloway, an external application (Ung. Hydr. Nit. Mit.?), which, by its invigorating influence, is not only to cure, but prevent cholera and many fevers. Talking of the good effects of his ointment in cancer and yaws, he says, "by rubbing this ointment morning and evening beneath the arm-pits, stomach, and thighs, *cholera* may *be set* at *defiance.*—Measles and small pox are greatly modified by using it in the same way." And yet this is a preparation sold within a few miles of John o' Groats, ranging therefore from the extreme points of our island.

But, gentlemen, how are we to get rid of this evil? I must premise that the *respectable* practitioner and chemist are both injured by quack medicines. When a community is witness to an illiterate person starting up, promulgating, with the greatest boldness, the *discovery* of a remedy said to cure all those diseases to which men, women, and children are subject, and which statement is never once contradicted by educated people, they are apt to treat the regular medical practitioner with contempt, and set aside his cautious and scientific treatment for that of the empiric. And even when the disease has gained ground, and necessitates them to lay the case before a physician or surgeon, they are ever ready to leave their native or resident place, and wander into some larger town to obtain the advice of some most celebrated man. Now, we might, without presumption, assume the position, that had this case been properly treated from the commencement, much trouble, pain, and inconvenience, might have been saved to all concerned, — the patient better, — and the practitioner and chemist equally benefited and more respected. This system of quackery is an abuse calling loudly for reform,—for thus is the medical profession in all its ramifications kept under,—nay, what better proof need we, than to revert to the time of the Morison mania, during which his pills were administered, either by his agents or by the friends of the patient, before the regular medicaments of the medical gentleman! Even death, caused by inflammation, from the drastic power of gamboge, has scarcely opened the eyes of some people; for, may I ask, is the use of those pills now obsolete? We answer no!! Why then, in face of this infatuation, what can be done? We might say, render it imperative on the newspapers to receive no quack medicine advertisements. This would check the circulation of the medicine to a great extent. But would it not strike at the very root of this evil, to have a legal enactment, by which the claims to utility of any discovery in medicine, might be determined by a committee of medical men, appointed for that purpose, invested with full power to *try practically* the *many virtues* ascribed to particular medicines. I state this simply as a proposition, and forward this (if your space will permit) for insertion in your excellent journal, that so attention might be drawn to a practice which has already reached to a dangerous extent. Before concluding, I would remark how much the nefarious plans of the empiric have been forwarded by the certificates of some of the first in our profession in London. Some of these I know to have been obtained under false colours, but why do the medical faculty not take some public way to make this known? They pass it quietly over, and thus hold out every inducement for such persons to proceed in their evil way; and assuredly the quack allows no chance or opportunity to slip, which has the least prospect of furthering his plans.

I have the honor to remain,
Gentlemen,
Your most obedient Servant,
Edinburgh.—G. S. I. M. R. C.

PATENT MEDICINE LICENCES.

Gentlemen—I beg, through the medium of your journal, to call the attention of your readers to a tax, which, in my humble opinion, is very unfair in its operation, as the following will show. 40*s.* is required by the stamp office for a licence to vend patent medicines in the cities of London and Westminster, the borough of Southwark, and the limits of the (late) twopenny post; beyond these limits 5*s.* only, except in cities and boroughs, when 20*s.* and 10*s.* are respectively demanded. Now I, as a country druggist, being resident within the prescribed limit, pay as much for my licence as the largest wholesale house in the trade! and, were I resident only a mile or two further from town, I should have to pay only one-eighth part of the sum I now pay, though I might probably vend many more medicines. Is it to be supposed, gentlemen, that I and others similarly situated in the range of the old twopenny post, can afford or ought to pay as much as the wholesale or largest retail businesses in the Metropolis? It is not justice; it is partial and unfair in its operation; and now that the postage is altered for the public benefit, I trust the scale of the Patent Medicine Licences may also be altered, and that we sufferers may not have so large a portion of our profits on the outlay of the capital so employed, absorbed by the tax in question.

In conclusion, I may add that some time ago I wrote to Mr. Hume, M.P., on the question, and he agreed with me as to the unfairness of the impost, and, moreover, offered to present a petition and support the prayer thereof, in the House of Commons, provided I got it numerously signed. I, however, had no time or means to accomplish that then, and there being no journal peculiar to us, to advocate our grievances, there the matter ended.

I am, Gentlemen,
Yours respectfully,
Sept. 7th, 1840. J. T.

NEW METHOD OF OBTAINING THE MORE POWERFUL VEGETABLE PREPARATIONS.

BY MR. BENTLEY.

We have been favoured by Mr. Bentley of Moorgate, with a pamphlet containing a detailed description of his very judicious mode of obtaining vegetable preparations, which as hitherto prepared are by no means regular in their action, as most of our readers will admit.

Mr. Bentley says he is aware "that some persons consider that the dried powder of the leaves possesses the whole properties of the plant; and I do not doubt that when the powder is fresh it may do so: but it is essential to bear in mind the fact that light acts as a decomposing agent, and that much precaution is necessary to prevent chemical action dissipating the principle upon which its efficacy depends.

"It has frequently been urged, and with some degree of truth, that vegetables vary according to the season in which they are gathered, and the nature of the soil from which they are procured; but I am not willing to attribute so much to this cause as to the careless, and, at present, defective manipulation.

"In the preparation of Extracts equality of temperature is a point of great importance.

"My observation on this point has been extensive; and I am fully persuaded that a temperature above 120° F. is sufficient to volatilize the principle upon which their efficacy depends.

"It will be my endeavour to show, by a process quite as simple as that at present is employed for obtaining the Extracts and Tinctures, that we may procure a preparation, uniform in strength, certain in its action, and not decomposable by light."

Mr. Bentley gives the following description of his process:—

"The plant being carefully selected from its healthy character and full maturity, the leaves, stem, and, when advisable, the root, are well bruised in a marble mortar, then placed in a powerful wooden press.

"The juice thus collected is allowed to stand, in order that a deposition of fæculent matter may take place, which it usually does, in very large quantities, in the course of twenty-four hours. Alcohol, 56° over-proof, is then added in the proportion of four fluid ounces to every sixteen fluid ounces of the juice, which is quite sufficient to render the preservation complete, and throw down any mucilage which may be mechanically suspended.

"After standing for twenty-four hours, the juice filtered through bibulous paper, (that made from wool is the best,) will be found to retain the whole virtues of the plant for any length of time.

"The juices which I have thus prepared, and which have been put to the test of experience, are those of Conium, Digitalis, Belladonna, Hyoscyamus, Taraxacum, and Artemisia Vulgaris."

Mr. Bentley's preparations have been used by many eminent medical men, and with the most complete success. Among those who have given their most unqualified approval to these preparations we may mention Drs. Gregory, Cobb, Kerrison, Fox, Little, Weatherhead and Munk; and Messrs. Kingdon and Pereira: to which we may add our own.

TRIAL OF MADAME LAFFARGE FOR POISONING HER HUSBAND.—CHEMICAL TRIALS.—OPINIONS OF THE CHEMISTS.

We lay before our readers a detail of the chemical trials to which certain portions of M. Laffarge's body were subjected. Our readers will find a great difference between the results obtained by the first chemists and those obtained by M. Orfila and his colleagues—a difference which has been very satisfactorily accounted for by the latter gentlemen.

The commissioners appointed by the court having effected the exhumation of the body, a hideous spectacle presented itself. The body was so much decomposed that, instead of the usual instruments, it was necessary, in order to take from it what was wanted, to use a spoon, which was sent for from the village. This species of paste, rather than flesh, was put into earthen pots, to be brought to Tulle. On their arrival the chemists placed their alembics near the Palais de Justice. Five or six furnaces were ranged in a circle, and supplied with charcoal from an enormous brazier, which was kept constantly at a red heat. The heights which commanded this extraordinary scene were crowded with spectators looking on the operations of this laboratory in the open air, but they were hindered by a dense and fœtid vapour from seeing much of what was going on. The odour emitted was so powerful, that at the afternoon sitting it was thought it would be impossible to remain in court. The ladies, however, sustained the annoyance with astonishing resolution.

After the experiments necessary to enlighten the tribunal had been performed, M. Dupuytren, brother of the late celebrated physician, read the report in the name of the commission of which he formed part. The report commenced by stating that the commission had operated first upon two-thirds of the liver, weighing, when dried, 120 ounces, 60 of which were dissolved in pure nitric acid, which was heated and evaporated until a friable spongy charcoal, weighing 21 grammes, had been obtained, which was pulverised and placed in a glass vessel with 90 grammes of distilled water. This was allowed to macerate for a whole night, and on the following day was put into a small retort and boiled for an hour. The liquid was then filtered, and the result was a brown liquid, to which was added sulphuric acid, with a few drops of hydrochloric acid, which formed a brown precipitate, soluble in ammonia. When acted on by the ammoniacal sulphate of copper, there was a green colour; by neutral nitrate of silver, there was a yellow precipitate; and the same result ensued from the action of ammoniacal nitrate of silver. All these precipitates became brown in a short time, and formed a new brown precipitate. The report then proceeds as follows: "We submitted this liquid to the test of Marsh's apparatus Whilst this was doing, some of the chemists fancied that they recognised for an instant a slight garlic (arsenical) odour; others did not perceive it; some obtained a brilliant brown stain infinitely slight. Dissolved in nitric acid, it gave no brick-red colour by ammoniacal nitrate of silver. We operated upon a portion of the stomach, heart, intestines, brain, bladder, and lungs, with distilled water, and for this purpose boiled the whole, cut into very small pieces, for six hours, renewing the water as it evaporated. When cold it was filtered, and the filtered liquid was evaporated until dry. What remained in this state was divided into two portions, one of which, weighing 7 grammes, was heated with 31 grammes of nitric acid, as in our first experiment. The charcoal which resulted was exposed for an hour to the action of boiling distilled water, and the filtered liquor was submitted to the same tests as for the first operation by Marsh's apparatus, and we did not obtain any trace of arsenic. We formed a new precipitate with sulphuric acid, sharpened with a few drops of hydrochloric acid, and filtered. The precipitate which remained was dissolved in water slightly ammoniacal, and then evaporated to dryness. The result was mixed with an equal weight of black flux, and placed in a reducing tube. We heated this to a red heat without obtaining any incrustation of metallic arsenic."

The above report was signed by Messrs. Dubois, sen. and jun. chemists, of Limoges; M. Lespinatz, physician, of Lubersac; M. Massenat, physician, of Paris; M. Tournadour, physician, of Uzerches; M. Lafosse, jun., of the same place, chemist; and Messrs. Fillel, Fage, and Bori, chemists, of Tulle. The Advocate-General put some questions to the chemists. M. Dubois, in reply, said, "Let the most celebrated chemists be employed. Enough of the body remains to convince the most incredulous" M. Lespinatz declared that as a physician he had believed there was a poison, but as a chemist he had not discovered any. He acknowledged his ignorance of the new process which had been used. M. Massenat also confessed that he had been in error. M. Paillet, Mad. Laffarge's counsel, observed that "The liver, the bowels, the lungs, the bladder, the stomach, every matter that it contained, and had been vomited from it, had been analysed. I cannot, therefore, comprehend how any doubt can be longer entertained as to the non-existence of poison." The Advocate-General nevertheless maintained that the evidence against the prisoner was still strong, and he should not abandon the prosecution. The court adjourned at half past six. At seven in the evening it was announced that the court had ordered that further experiments should be performed by chemists of Paris, and that Messrs. Orfila, Chevalier, and Devergie, had been named.

At the sitting on the 14th September, M. Orfila rendered an account of his labours. He read the following detail of the experiments he had employed, and came to the conclusion that he had detected the PRESENCE of ARSENIC in the body of M. Laffarge! Addressing the court in the name of himself and MM. Ollivier d'Augers and Bussy, amidst profound silence and the deepest attention, he said,—"We come to render an account of our labours. All the experiments have been made with the tests employed by the chemists who preceded us; but we employed a certain quantity of potassa, which we brought from Paris, and which those gentlemen did not think of using. These experiments were made in the presence of at least eight members of the commission. The following are the results:—1. "I will show that there was arsenic in the body of Laffarge. (General stupor. The prisoner remained motionless.) 2. That this arsenic does not result from the tests with which we operated, nor from the earth surrounding the coffin. 3. That the arsenic extracted by us is not of that arsenical portion which exists naturally in the body of man. 4. And finally, I shall show that it is not impossible to explain the diversity of results and opinions of the other experiments when compared with our own.

"1. Arsenic exists in the body of M. Laffarge. We commenced our operations with treating one quarter of the stomach which remained, the vomited matter, and the liquids found in the stomach. These three matters united being carbonised by means of nitric acid, according to the process which I indicated eighteen months ago for the first time, and the carbon produced having been treated with water, we introduced the liquid resulting from it into Marsh's apparatus to obtain an inconsiderable quantity of arsenic, which is now deposited on a plate in our laboratory. A second experiment was made with the mass, described in the *procès verbaux* as the mass arising from the organs of the thorax, the abdomen, the liver, part of the heart, and certain portions of the liver and brain. We divided this into two parts. The whole being at first mingled, we boiled it for some hours with distilled water; the liquor from this, after being passed through linen, was reduced by heat to nearly dry matter. A portion remained undissolved, as in the case with meat when boiled—a part dissolves, the rest does not. The decoction being evaporated to desiccation was carbonised by nitric acid, in the same way as the first matter. We operated as we did before, and we again extracted arsenic from this liquid. The quantity of arsenic obtained from this decoction was nearly equal to that which we produced by the first experiment.

"We now felt it our bounden duty to examine minutely the remaining portions which had not been dissolved. As we should have been impeded with a great quantity of froth had we treated it with nitric acid, we did as I indicated 18 months ago—we burnt it with nitrate of potass. It burnt seven hours, and after treating this incinerated mass as before, we obtained a remarkable quantity of arsenic, which may be estimated at twelve times that which was produced by our first experiments. We did not feel it necessary to act upon the totality of our produce. We examined the pieces of flesh taken from the left thigh of the corpse, and made it the subject of a distinct operation. We obtained nothing from these two pounds of muscular flesh treated in the same manner as above. These, compared to the weight of the muscular flesh of the whole body, represent but a very small portion. The result upon this point, therefore, was negative. We examined a portion of the winding sheet in which the body was wrapt; we examined it with great care; we boiled it in water with potass, and afterwards put the liquid into Marsh's apparatus, and we obtained nothing. This, therefore, was another negative result. Finally, we examined two of the three portions of earth collected. Our analysis was applied to those taken from immediately over and under the coffin. These two portions were boiled separately in distilled water for four hours, and produced a mass which, on being submitted to Marsh's apparatus, did not give any arsenic. Thus it results from this first part of my deposition, and the experiments which have been made, that there was arsenic in the fourth part of the stomach which remained in the liquids contained in the viscera, and in the matter vomited, but there was not much. It results, in the second place, that in the decoction made with the organic fragments there was much, and in the solid residuum of this decoction a great deal more. Lastly, it results that we did not find any elsewhere.

"2. The arsenic found did not arise from the reagents employed. These reagents had been already employed by the chemists from Tulle, and the proof that they do not contain arsenic is, that these chemists came to the conclusion that there was not any. If there had been any in the reagent they would at least have ascertained the presence of such arsenic as might be found in them. We ought to observe, that we never put Marsh's apparatus in action until we were certain that it would operate during a quarter of an hour or twenty minutes, without any accident happening. The nitric acid has been distilled with nitrate of silver. It is impossible in this state that it should contain any arsenic. No doubt can be entertained on this point. The arsenic found cannot have arisen from the earth, because the coffin remained whole except a small crevice at the bottom. Besides, the earth produced none on being analyzed.

"3. Does the arsenic found come from that arsenical portion which is found naturally in the human body?—It has been acknowledged from my experiments, that there exists in the bones of man, and many other species of animals, an infinitely small quantity of arsenic, but it is equally ascertained that by the means we have at our command we can never produce the least trace of arsenic either from the stomach, the liver, the spleen, the kidneys, the heart, or the lungs of man. Now, we have operated not upon the bones, but upon the internal organs. What we have extracted is, therefore, not normal arsenic.

"4. It is not difficult to explain the diversity of the results obtained by us comparatively to those which were furnished by the chemists who had previously examined the body and liquids. To prove this, I will follow the series of operations which have been made. On the first report, MM. Bardou, Lespinatz Tournadour, Massenat, and Lafosse operated. They boiled the stomach—they treated the decoction with sulphuric acid—they obtained a yellow precipitate, flaky and soluble in ammonia, characters which belong to all arsenical acids. They then sought to reduce this sulphate of arsenic to its metallic state. Their tube burst. The matter they obtained did not sufficiently establish the presence of arsenic, as I said in the letter I had the honour of addressing to M. Paillet:—"Medical jurisprudence is not satisfied with suppositions, it requires positive proofs. The metal must be reproduced." With the knowledge I have gained by making the experiments on the body of M. Laffarge, I am convinced that these gentlemen, if their tube had not been broken, would have found metallic arsenic. This first experiment therefore cannot be opposed to ours, because it was never brought to a conclusion. In the second report Messrs. Dubois and Dupuptren proceeded separately, and at first on a quarter of the stomach, afterwards on the liquids it contained, and lastly on a portion of the matter vomited. Thus there were three operations. Now, we have united these three matters and made but one operation, and instead of acting separately upon each of the three, we have acted upon them all together. Although we have thus acted, the quantity of arsenic obtained is extremely minute. Is there anything extraordinary in this—that an individual should be unsuccessful in making experiments on one-third of a mass, while he who acts on the whole should be successful? Marsh's apparatus is of a recent date. It has not yet been perfectly studied by every one, and even those who have studied it frequently find themselves embarrassed in using it. Thus to-day, even when we were going to take out some arsenic which remained in it, all of a sudden, although we were certain it was still there, we could not obtain it. This arises either from the flame being too strong, the porcelain plate being put too near, or not near enough, or from a door being opened, and the draught turning the flame in another direction, or other causes. It is not then extraordinary, that when quantities so small are operated upon, no result should be arrived at.

I take pleasure in doing justice to the talents and abilities of those gentlemen who have made the experiments, but it is evident they have acted upon too small a quantity of matter, and that Marsh's apparatus has been used with a flame a little too strong, and the small quantity of arsenic existing has been volatilized. I see nothing which is inconsistent with the result we have obtained. In fine, in the last experiment, made after exhumation, the united chemists operated upon only a very small portion of the liver. They treated it with distilled water, but they did not act upon it with nitric acid, and in this matter they found nothing. We have operated on the whole of the viscera, and found only a small portion of arsenic. These gentlemen afterwards operated upon only a fourth of the other viscera, while we made our experiments upon the whole. I admit that the process followed by these gentlemen is indicated by certain writers. If it is not the best, it is not the fault of those who used it. In this matter there has been great progress made in latter times. Thus it was not sufficiently considered that animal matter mixed with arsenic retains the poison for a long time, and is with difficulty separated from it by boiling, and hence it has been that in many instances poisonous matters have escaped the researches of chemists.

Having now gone through all that I had to lay before the court, I am bound to add that no doubt can remain as to the nature of the matter we have obtained. Metallic arsenic has been collected on the plates, and the commission, composed of three persons, to whom were joined all the other chemists, will, I do not doubt, unanimously declare that the metal obtained on the capsules is arsenic. But this is not sufficient. It must be stated by what means we are assured that it is arsenic. The stains are brown and shining; they do not attract the moisture of the air, they do not become volatilized by the cold, but the instant heat is applied they disappear. They dissolve and detach themselves instantly on the application of pure nitric acid, and this solution being complete, if it is evaporated into dryness, it gives a white residuum, with a light yellow tint, which nitrate of silver converts into a brick-red. No other substance unites in itself these characters, and therefore I am bound to conclude that the matter is arsenic."

M. Ollivier and M. Bussy signified to the court that they fully concurred in all M. Orfila had stated.

ON HACHISCH.*

In a work lately published by Dr. Aubert, that gentleman has devoted an article to a peculiar substance, to which M. de Sacy had given the name *hachisch*, and which is very extensively used among the Arabs, and which produces a kind of intoxication. Dr. Aubert has examined this vegetable: the following is what he says of it:—

"If we examine the leaves, flowers and seeds of this plant, we might almost recognise a kind of hemp. Hachisch is indeed of the same family and genus. It is an annual plant which grows in all parts of Lower-Egypt, where it is largely consumed and is in great demand. We are assured that it is cultivated also in Syria, and some parts of Asia-Minor. The difference which exists between hemp and hachisch is in the stem: the latter is not more than two or three feet high at most; its stem branches from the foot. The branches are alternate, and there are not met with on its stem those filaments which are observed on that of hemp: its smell is not so strong as that of hemp, and is rather peculiar. The commonest and most certain means of experiencing its effects consists in making a decoction of this plant: when it is finished fresh butter is added, and the whole is left on the fire until the liquid is completely evaporated; the butter is then strained through a cloth; it has then become of a fine green color. It is used in combination with sugar, pistachios and other ingredients."

The following are the effects which Dr.

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* *Journal de Chimie Médicale*, August 1840.

Aubert says he has obtained: we use his own words:—

"I have taken it under the form of lozenges of a greenish color, having a sickly taste, but very much disguised by the pistachios and the essences of rose and jessamine. Its effects on me were not very marked; not knowing the substance, I was prudent. One of us imagined that he was going to die of apoplexy in the night, and delivered us discourses on life, and on the manner in which we ought to conduct ourselves. I was much astonished at the gaiety which arose, the strange ideas which were given out, and those which ran through my head.

"A few days after I doubled the dose, and I sat myself in the divan, taking coffee in order to develope the effects of this substance. I was talking when I felt a kind of pricking in my feet, and a compression in my head, which suddenly dissipated; my head seemed to be empty. I then experienced peculiar sensations; every thing assumed a new face; the figure of my neighbour seemed the most grotesque in the world; I burst out laughing at his nose, and this laugh continued for nearly an hour —a trifle renewed it. During this time the most strange and varied ideas passed through my head with surprising rapidity. I felt perfectly comfortable, and without one painful sensation; the past, the present and the future no longer existed. I knew but the very moment which passed by me; it was the most complete *dolce farniente.* Afterwards all became calm; I was desirous of sleeping. The whole night was one agreeable dream.

"On waking I had an accurate remembrance of what had passed; my head was not heavy, nor was my mouth clammy, as after opium or wine.

"I continued to take this substance with my friends, in order to study the effects which it produced on us.

"The first effects are, an extreme pleasure which is found in stretching oneself on a divan, in smoking and taking coffee, and a repugnance for every kind of motion. Afterwards the eyelids close, as if light were disagreeable. The strangest ideas begin to come into one's head; great laughing and extravagances, both in words and actions, follow. The Arabs call these last effects *fantasia.* In the midst of all this an almost canine appetite is felt: wine is disagreeable. The effects go on increasing and gradually cease, and the whole is terminated by a soft sleep and pleasant dreams; no headache or fatigue, or uneasiness in respiration.

"The effect on the nervous system, therefore, is mild; it is well characterised in its action by the hunger, the extravagances, and the rapidity of the ideas."

It is desirable that new trials be made, in order to confirm the curious details given by Dr. Aubert.

TO CORRESPONDENTS.

X.'s suggestion will in future be acted on.

A Subscriber. — We believe that Dr. Thomson's work on organic chemistry contains a good detail of that kind of analysis: we know of no work exclusively devoted to the subject.

C. W. R.—The chief alteration is the formation of sebacic acid.

G. and J. L.—We do not know of any work treating solely on those arts: we may recommend Dr. Ure's Dictionary of Arts, Manufactures, and Mines, as a good book of reference in all departments of chemical manufactures.

A Drug Broker.—We cannot insert our correspondent's letter: we hope that the New Medical Reform Measure will prevent oilmen and grocers, or any but druggists, from selling or compounding ANY DRUG.

R. B. M.—Care should be taken that the temperature be such as to insure a sufficient evaporation of water, in the vessel containing the phosphorus. The appearances show that the revival was not *complete;* greater power, therefore, is required.

A SUBSCRIBER is informed that the Monesia, or, as it has lately and more correctly been termed, Buranhem, may be obtained at Messrs. Savory and Moore's, New Bond Street. We have not seen the formula in question.

M. F. I., Truro.—We cannot give insertion to such twaddle. Our correspondent rightly estimated the value of his communication in considering it not worth his while to pay the postage of it.

RECEIVED.—The Prospectus of the London Mechanics' Institution. Among the Lectures to be delivered during the present quarter are a course of four on the Metals by R. H. Semple, Esq.; and one of six on the Nutritive Processes in Animals, by R. D. Grainger, Esq.

WANT OF SPACE again compels us to defer answering many of this month's correspondents.

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

EXTRACT FROM A MEMOIR ON THE ESSENTIAL OILS.*

BY M. PELOUZE.

ESSENCES EXTRACTED FROM THE DRYOBALANOPS CAMPHORA.

I am indebted to the kindness of Dr. Christison of Edinburgh for the two very rare substances, the consideration of which is the chief object of this paper.

One of these matters is solid, and is known by the name of *camphor of Borneo:* the other is fluid, and is called *liquid camphor*. Both are extracted from the *Dryobalanops Camphora*.

The solid matter is found in the cavities of the trunk of the old trees. When the trees are young they do not contain solid camphor: but on making incisions in them, a liquid of a greenish yellow color flows out. It is an essential oil mixed with about five or six hundredths of its weight of a peculiar resin, differing from camphor. This essence, which is the liquid camphor of Borneo, is very much used in the East, where it has long been employed, it is said successfully, in rheumatic affections. Solid camphor forms part of the Materia Medica of the Chinese, who class it among their aphrodisiacs.

Thus, according to Dr. Christison, to whom I owe the foregoing information, the *Dryobalanops camphora* produces three substances differing in nature from essences or resins, namely, the two camphors and a resinous body, which are found in solution in the essential oil of Borneo, from which it may be separated by distillation.

The sample of essence sent me by Dr. Christison had undergone this operation: consequently, I was obliged to limit my work to the examination of the two essences.

CAMPHOR OF BORNEO.

It is presented in small crystals, or rather in fragments of white crystals, transparent, very friable, of an odour partaking of that of ordinary camphor, and of that of pepper, and of a hot and burning taste, like that of essences in general. Its density is inferior to that of water. It is very sparingly soluble in that liquid, and very soluble, on the contrary, in alcohol and in ether.

According to the symmetry of the faces which yet remain in the crystals, all of which are more or less defaced, it would appear that its form is a prism with six regular faces, arising from a rhomboidal system.

The camphor of Borneo enters into fusion at 198° C., and into ebullition at 212° C. At this temperature, it distils without undergoing any alteration. The thermometer, plunged into the bath, remains stationary from the commencement to the end of the sublimation, and the distilled matter is always in every respect identical with the camphor of Borneo in its natural state.

Many analyses of the concrete substance of Borneo have given me, for its composition, the formula: $C^{20} H^{36} O^{2}$. These analyses were sometimes made with the finest samples of the camphor of Borneo, and sometimes, with the matter sublimed, or deposited in neutral solvents. MM. Frémy and Deville, who have been kind enough, at my request, to repeat my analyses, have arrived at the same results.

The numbers $C^{20} H^{36} O^{2}$ represent four volumes of the camphor of Borneo. A temperature of from 240 to 250 degrees being insufficient for altering the concrete essence, its density of vapour may be determined with great accuracy.

Slightly heated with anhydrous phosphoric acid this camphor is suddenly decomposed with production of heat, and without any disengagement of elastic fluid. Water is formed, which combines with the phosphoric acid, and a new hydro-carbon, isomeric with the essence of turpentine and the numerous hydro-carbons which MM. Soubeiran and Capitaine designate under the name of camphenes.

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* *Académie des Sciences:* Sitting of August 31, 1840: *Comptes Rendus*, No. 9.

The formula of this hydro-carbon is
$C^{20}H^{32}=C^{20}H^{36}O^{2}-H^{4}O^{2}=4$ vol. of vapour.

Some chemists are of opinion that the essential oils, thus decomposed by phosphoric acid into carburetted hydrogen and water, ought to be looked upon as containing binary compounds, quite formed, and ranked in the series of alcohols, when the hydro-carbons which they contain have the faculty of uniting with the hydracids. This view being adopted, the camphor of Borneo would have for a formula,

$$C^{20}H^{32}, 2\,H^{2}O.$$

But this is a pure hypothesis, from which it appears to me impossible to draw any probable inference as to the constitution of essential oils. It may easily be conceived that, on one part the great stability of water, and on another part, the great affinity of anhydrous phosphoric acid for it, determines the re-union of all the oxygen of the organic matter with a corresponding quantity of hydrogen in order to form water, which did not exist while the remainder of the hydrogen was combined with the whole of the carbon.

The liquid camphor of Borneo has a peculiar odour which is not camphory, and which very much resembles that of essence of turpentine. It is lighter than water, and almost insoluble in that liquid; it boils at about 165° C.

Dried over chloride of calcium, it presented the same composition as the carburetted hydrogen extracted from the solid camphor, by anhydrous phosphoric acid. It absorbs the same quantity of hydro-chloric acid gas as essence of turpentine. However, M. Biot, who has been kind enough to examine it, has found a different molecular condition.

Left to itself in a partially closed vessel, the liquid camphor of Borneo is very rapidly oxidized. Its formula, which at first was $C^{20}H^{32}$, becomes $C^{20}H^{32}O^{4}$. This absorption of oxygen, remarkable for the rapidity with which it takes place, does not appear to be accompanied with any formation of carbonic acid. Unfortunately, I had too little essence of Borneo to give much scope to the study of that substance.

M. Theodore de Saussure has long since proved that the essential oils in general absorb a great quantity of oxygen in contact with the air, and that they produce a considerable quantity of carbonic acid, but less however than the quantity of oxygen absorbed. It does not appear that this is always the case, when the essential oils have been carefully purified before their contact with the oxygen of the atmosphere. The liquid essence of Borneo presents an example of the contrary.

The essential oil of lavender, when very pure, produces a volume of carbonic acid which does not amount to $\frac{2}{100}$ of the oxygen which it absorbs.

The *Dryobalanops Camphora* secreting, while young, an almost pure essential oil, whose composition is $C^{20}H^{32}$, and producing, at a more advanced age, another essence, whose formula is $C^{20}H^{36}O^{4}$, it seems natural to believe that the latter substance, that is to say, the solid camphor of Borneo, derives from the liquid camphor which would have fixed, in the course of vegetation, the elements of a certain quantity of water. It would be interesting to examine, at different periods, and under a similar point of view, all the vegetables which produce essential oils and resins. The result of such investigations, doubtless, would enlighten us on many obscure points of organic chemistry; for little or nothing is known of the relations of composition and formation which exist, or may exist, among the essences and resins secreted by the same vegetables.

It has been thought that the most important resin, colophane, the formula of which is supposed to be $C^{20}H^{36}O^{2}$, is produced by the oxidation of essence of turpentine, which is $C^{20}H^{32}$. M. Laurent has shewn that the different isomeric acids whose mixture constitutes colophane, were composed in the atomical proportions of $C^{20}H^{30}O^{2}$; so that, relying on these analyses, colophane, if it be derived from essence of turpentine, should be produced all at once by the removal of the hydrogen and by the oxidation of the latter resin. As two equivalents of oxygen replace only one of hydrogen, it would be well to ascertain if an intermediate product, $C^{20}H^{30}O$, does not precede $C^{20}H^{30}O^{2}$, and if, in very young trees, which secrete turpentine, this hydro-carbon is only concentrated, like the liquid essence of Borneo, in the *Dryobalanops Camphora* which has not attained its full development.

As to the inferences which possibly might be drawn from the examination of the products of the *resinification* of essences, they would be very vague, and often even erroneous. In proof of this assertion, I may mention the essence of turpentine.

Left to the solar radiation, it is gradually changed into a viscous matter which resembles natural turpentine, and which gives, by evaporation, a matter completely resembling colophane in odour and appearance. But it would be wrong to confound this matter with colaphane, for I have found it to have a different composition. Besides, it is accompanied by a liquid, oxygenised essence, which arises in the air at the same time as it, and which is not found in recent essential oil of turpentine that has been kept in well-closed flasks.

From the preceding observations, concerning which I will say more in a future Memoir, it very evidently results that the resins which arise from the slow action of the atmospheric air on the essential oils, ought not to be confounded, if not always, at least in certain cases, with the resins produced during vegetation.

Chemists have long been acquainted with a combination of hydro-chloric acid and essence of turpentine, which has improperly been designated *artificial camphor.* This substance resembles ordinary camphor only in its odour; its composition is essentially different, since it contains chlorine, which is not one of the elements of ordinary camphor. As yet camphor has not been artificially obtained. The concrete juice of the *Dryobalanops camphora*, setting aside its odour, does not seem to be more analogous to camphor, than any other oxygenous essence. This odour alone has obtained for it the name of camphor, as is the case with the artificial camphors of turpentine and lemon.

On boiling the concrete essence of Borneo with nitric acid of average strength, abundant reddish vapours are disengaged, while a liquid of an oily appearance floats on the surface of the acid. Water, added to this species of oil, precipitates from it white light amorphous flocks, which have the smell of ordinary camphor, without its clearness. Collected, washed, and filtered, these flocks present all the characters of laurel camphor. The same composition, the same terms of fusion and ebullition, on both sides of liquefaction in hydro-chloric acid gas, absorption of the same quantity of that acid, —in a word, complete identity.

If nitric acid at its maximum of concentration be poured on the concrete essence of Borneo, a considerable disengagement of heat, accompanied by a great quantity of reddish vapours, is immediately manifested. To avoid an explosion, small quantities of matter must be operated on. In this case, the formation of the compound of nitric acid and ordinary camphor is crystallised; with less concentrated nitric acid, it must be heated to produce the effect; when cold it acts very slowly. In all cases, the formation of the camphor of Borneo into ordinary camphor, is uniformly accompanied by reddish vapours of deutoxide of nitrogen.

Is the camphor of Borneo a mixture of ordinary camphor and water, or of several other matters not ascertained? Or, indeed, is it a definite combination, of which camphor forms a constituent part?

Without resorting to experiment, the first question may be answered in the negative. All the properties which constitute a chemical species are found in the camphor of Borneo.

As to the second question, that of the pre-existence of a combination of ordinary camphor in the concrete essence of Borneo, it is scarcely possible to resolve it in a positive manner. However, I think there is nothing to warrant such an opinion. Ordinary camphor combines with acids,—not only with the mineral, but with certain organic acids, as for example, camphoric acid. But as nitric acid, which is made to act on the concrete essence of Borneo, does not produce less than 96 per cent. of its weight of ordinary camphor, it is impossible to admit that the three or four hundredths of matter which are wanting, represent the acid required for saturating camphor. Again, hydro-chloric acid combines with the concrete essence of Borneo, without liquifying it, and by heating the combination the essence is extracted unaltered.

Is the camphor of Borneo a hydruret of ordinary camphor? For example, is it to the latter, what white indigo is to blue? Nothing authorises this supposition: a host of organic matters produce oxalic acid on being treated by nitric acid, without being considered to contain oxalic acid.

The concrete essence of Borneo containing carbon and oxygen in the same proportions as ordinary camphor, and differing from it only by containing a more considerable proportion of hydrogen, it may very well be conceived that the oxygen of the nitric acid carries its dehydrogenising action to the excess of hydrogen to form water, and that the remaining elements combine in order to produce common camphor, whose combination with nitric acid presents great stability. With so energetic an agent as nitric acid, it is not necessary, in order to account for the presence of camphor in the above-mentioned case, to admit its pre-existence in the concrete essence of Borneo.

In a future Memoir on the essential oils and on their relations with the resins which correspond with them, I shall take an opportunity of reverting to the subject which I have just thus slightly touched upon.

For the present I wished to communicate to the Academy the interesting fact of the artificial production of the ordinary camphor of commerce—of a camphor identical with that of the *Laurus camphora.*

In conclusion, I may add that M. Biot has found in the artificially produced camphor, a power of rotation which proceeds in the same direction, and which has the same intensity as that of ordinary camphor; and that he has thus given to my results such a confirmation, that no one, I hope, will hesitate to consider them as definitively acquired to science.

NEW INVESTIGATIONS CONCERNING ESSENCE OF TURPENTINE.*

BY M. DEVILLE.

I think I have arrived at the demonstration of this principle that essence of turpentine being considered as a homogeneous substance, gives rise to an unlimited number of substances isomeric with it, and exhibiting, in certain cases, such chemical and physical characters as to permit the differences among themselves and between themselves and essence of turpentine to be very clearly established. The law which regulates their formation is very simple: every reagent which acts on essence of turpentine and on these substances, to disengage them from a combination of which they form part, modifies them in their molecular state and converts them into other substances, which sometimes have nothing in common with that which has given rise to them, except their elementary composition. Thus, therefore, every reaction creates a new body.

It is under these circumstances that the liquid camphors (hydro-chlorate, hydro-bromate and hydriodate) of turpentine are produced. The same also, when it is wished, by treating these camphors, and even solid camphors by lime, to remove from the acid the oily base which it retains, there is always obtained, not that base itself, but a body isomeric with it. The latter is capable of producing a third substance after its combination with an acid, and the destruction, by an alkali, of the compound which results. In a catalogue, which might be made, of these bodies derived from essence of turpentine, the number of reactions which were necessary to their production, would determine the class to which they should belong.

I first studied the series of bodies which give rise to liquid products. The base of liquid camphor, terebene, which cannot be separated from its combinations, but which I have found in one of the results of the action of concentrated sulphuric acid on essence of turpentine, yielded by its combinations with the haloid acids, mono-salts and bi-salts, whose common character was the complete absence of rotation, which is also wanting in terebene.

I proved that hydro-bromic and hydriodic acids gave artificial camphors, with essence of turpentine, the hydro-bromate alone being solid and crystallised, and resembling the corresponding hydro-chlorate so much, that it is impossible not to confuse them by sight and smell. The oily bases of these combinations (M. Dumas' camphene), have the same rotation, the same also as essence of turpentine. The hydriodate of camphene is liquid. Hydro-fluoric acid is the only haloid acid which enters into no combination.

The distillation of colophane, repeated a great number of times, gave exactly the same results as the action of sulphuric acid on essence of turpentine, namely, terebene, and a new body, isomeric with the essence, colorless, viscous, boiling at 315° C., volatile without decomposition, and rather less dense than water. It has no rotation.

I have also studied some of the substances of the second formation, which arise from a molecular alteration undergone by the bodies which are derived from essence of turpentine.

Indeed, I have obtained chloric and bromic combinations isomeric among themselves, and which result from the decomposition of the essence and the bodies derived from it, by chlorine and bromine. They have this feature in common, that heat decomposes them, yielding carbon, hydro-chloric or hydro-bromic acid and hydro-chlorate or hydro-bromate of the base which has been, to prepare them, treated by chlorine or bromine. Thus the chloro-camphene $C^{40} H^{24} Ch^{8}$ gives carbon, hydro-chloric acid and hydro-chlorate of camphene (solid artificial camphor). Chloro-terebene gives the same products, except that the camphor which is produced is liquid.

Besides, I have obtained with colophane that body which is extracted from colophane, which is produced also in the action of sulphuric acid on the essence, the combination $C^{80} H^{64}, Ch^{8}$ which corresponds with colophane $C^{84} H^{64} O^{4}$ and which has all the appearance of it.

Chlorine and bromine, in acting on essence of turpentine, give bodies which have the same composition, $C^{40} H^{24} Ch^{8}$, $C^{40} H^{24} Br$, as those which I formerly spoke of. I remarked that terebene and essence of turpentine, which are of the same density, give rise to products with chlorine and bromine, also of the same density.

This chloride and this bromide of essence of turpentine may be considered as mixtures or combinations of chlorides and bromides of camphene and terebene. They also yield, by distillation, carbon, hydro-chloric and hydro-bromic acids and mixtures of liquid and solid camphors, or hydro-chlorates and hydro-bromates of camphene and terebene. In the same manner colophane may be considered as a mixture of oxides of camphene and terebene.

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* *Académie des Sciences;* Sitting of Sept. 7: from *Comptes Rendus,* No. 10.

ON A NEW SALT OBTAINED FROM IODINE AND CAUSTIC SODA.*

BY PROFESSOR FRED. PENNY.

While examining the action of iodine on carbonate of soda, a salt was obtained, which crystallized in regular six-sided prisms, and which gave by analysis sodium, iodine, and oxygen, in proportions not corresponding to any known compound of these elements. The same salt was also prepared by saturating a solution of caustic soda with iodine, and allowing the solution to evaporate spontaneously. At first, this salt was thought to be the same as that described by Mitscherlich in his Elements of Chemistry, and to which he gives the following composition $Na\,I + Na\,O,\ I\,O_5 + H\,O_{20}$; but the analysis gave very different results.

Professor Penny gave the following characters of this salt:—

It is white and inodorous, has a sharp, saline taste, crystallizes in short six-sided prisms, is soluble in cold and hot water, and is decomposed by alcohol into iodate of soda and iodide of sodium. It effloresces on exposure to the air, and is very readily decomposed by heat; abundance of water is first evolved, and then oxygen with a trace of iodine. Its solution is perfectly neutral to test papers, gives a pale lemon yellow precipitate with acetate of lead, yellowish white with nitrate of silver, and a fine bright yellow with pernitrate of mercury. It is not affected by solution of starch, but is instantly decomposed with precipitation of iodine by nitric, sulphuric, acetic, and hydrochloric acids. The latter acid in excess converts it wholly into chloride of potassium.

Professor Penny detailed a very remarkable circumstance attending the formation of this salt from iodine and caustic soda. When the solution is allowed to evaporate spontaneously, long prismatic crystals of iodate of soda are deposited; but as the evaporation continues, these crystals are re-dissolved, and are replaced by those of the new salt. In one experiment this change was very striking. The solution on Saturday night had deposited an abundance of fine crystals of iodate of soda, but on Monday all these had disappeared, and a crop of the new salt had crystallized. The prior deposition of iodate of soda generally occurs in the preparation of this salt; and from other experiments it seems necessary that there should be an excess of iodide of sodium in the solution, and that the solution should be strong, in order that the salt may form. When this salt is dissolved in water, and the solution evaporated spontaneously, crystals of iodate of soda deposit, but very few of the new salt will form.

The salt may also be procured by pouring a saturated solution of iodide of sodium on crystals of iodate of soda, and setting them aside for some days. The crystals will be dissolved and will be replaced by crystals of the new salt.

Professor Penny then gave the details of his analysis of this salt, and the following formula, as agreeing best with his results:— $Na_5\,I_5\,O_{12} + 38\,H\,O$; or, regarding it as a compound of iodate and iodide, it may be thus represented: — $3\,Na\,I + 2\,Na\,O\,I\,O_5 + 38\,H\,O$. According to this view, it is the sesqui-iodide of iodate of soda.

ACTION OF NITRIC ACID ON THE CHLORATES, IODATES, AND BROMATES OF POTASSA AND SODA.†

BY PROFESSOR F. PENNY.

This communication contains the details and results of experiments undertaken with the view of confirming the correctness of the author's researches on equivalent numbers. In this he has been disappointed, the action being attended by circumstances which render it inapplicable to so delicate a purpose as the determination of equivalent numbers. However, the results that he has obtained are new, and he considered them sufficiently interesting to be worthy the attention of the Section.

In order to examine the action of nitric acid upon chlorate of potassa, a known weight of the salt was mixed in a retort with a measured quantity of the acid, and the mixture was heated on a sand bath; as soon as it became warm, chlorine and oxygen were evolved in a state of mixture and not of combination, and the chlorate gradually disappeared. The solution was then evaporated to dryness, and the saline residue was found to be a mixture of hyperchlorate and nitrate of potassa, in the proportion of three equivalents of the latter to one of the former. The author thus expresses the reaction which takes place:—

$$4(K+Cl+O_6) \text{ and } 3(N+O_5) = (K+Cl+O_8) \text{ and } 3(K+N+O_6) \text{ and } Cl_3 \text{ and } O_{13}$$

The action of nitric acid on chlorate of potassa differs, then, from the action of sulphuric acid on the same salt. With nitric acid the salt is tranquilly decomposed, and the chlorine and oxygen liberated uncombined, whereas with sulphuric acid these gases are evolved in a state of combination, forming that dangerously explosive compound chlorous acid. Nitric acid, therefore, is to be preferred for the preparation of hyper-chlorate of potassa, as with it the operation may be conducted without those violent detonations that are so apt to occur with sulphuric acid. The action of nitric acid on chlorate of soda is the same as upon chlorate of potassa. The chlorine and oxygen set free are in a state of mixture, and every 4 atoms of chlorate yield 3 of nitrate and 1 of hyper-chlorate.

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* Read to the British Association at the Glasgow Meeting; from *The Athenæum*.

† Communicated to the British Association at the Glasgow Meeting; from *The Athenæum*.

Hyper-chlorate of soda is a very soluble salt, and crystallizes in small rhombs. It is readily decomposed by heat, but is not acted on by hydrochloric acid. It deliquesces on exposure to the air.

The action of nitric acid on an iodate is very different from that on a chlorate, and is well illustrated in the case of iodate of potassa. When iodate of potassa is boiled for some time with a great excess of nitric acid, it is decomposed into potassa and iodic acid, the potassa combines with its proportionate quantity of nitric acid, forming nitrate of potassa, and the iodic acid is deposited from the solution in minute, hard, and transparent crystals. If the acid solution of nitre, containing the iodic acid, be then evaporated, a re-action takes place: the iodic acid decomposes half of the nitre, liberates its nitric acid, and combines with the potassa, forming the biniodate. This change is completed when the mixture is dry, and if the heat be then withdrawn, a definite mixture of biniodate and nitrate is obtained. If the heat be continued, a still further change occurs, the iodic acid expels the whole of the nitric acid, which is evolved as nitrous acid, and oxygen and neutral iodate of potassa remain. By adding fresh nitric acid to this iodate, the same changes may be produced by a proper regulation of the temperature.

By acting upon iodate of soda with nitric acid, Prof. Penny has formed a biniodate of soda, and by adding a considerable excess of iodic acid to a solution of iodate of soda he has obtained a teriodate of soda. Both of these salts are anhydrous. The biniodate of potassum contains one atom of water. He also finds that crystals of iodate of soda contain various quantities of water, according to the strength of the solution from which they have deposited. From a hot and strong solution this salt crystallizes in acicular tufts, and the thus procured crystals contain two atoms of water. If the solution be rather weak, long four-sided prisms are obtained, and these crystals contain six atoms of water. If a solution of iodate of soda be allowed to evaporate spontaneously, large irregular prisms deposit, and these contain ten atoms of water. They effloresce rapidly on exposure to the air, and in this way lose eight atoms of water.

The action of nitric acid upon bromate of potassa was next examined, and was found to differ remarkably from the action of this acid on the chlorate and iodate. Neither hyper-bromate nor bi-bromate is produced, but merely nitrate of potassa. The nitric acid disengages the whole of the bromic acid, and this, at the moment of its liberation, is resolved into its elements, bromine and oxygen.

In conclusion, the author remarks that the action of nitric acid on these three classes of salts affords a ready method of distinguishing them from one another.

ON THE COMBINATION OF CYANURET OF MERCURY AND CHLORIDE OF POTASSIUM.*

BY M. LONGCHAMP.

The cyano-chloride of mercury and potassium is white, very light, and in silky needles. It is a compound of cyanide of mercury, two atoms; chloride of potassium, one atom.

The heat of the sand-bath disengages from it 4 per cent. of moisture; but M. Longchamp does not admit that this is combined water. He presents some new views concerning the nature of the force which determines the crystallization of salts. Taking sulphate of soda as an example, he shows that the axis of this salt is formed of an empty hexahedral prism, whence he concludes that crystillization is effected by the repulsion of the saline particles, and not by their attraction. Round the hexahedral vacuum of the axis of the crystal of sulphate of soda, is formed a hexahedral coating of salt; the repulsion of the particles of this coating operating on the saline particles which surround it, a new vacuum is formed, and, round it, a new coating of saline particles; and thus is the crystal formed successively of a vacuum and a saline side. But if it be thus, salts in crystallizing should augment the volume of the mass in the midst of which they are formed, as water does; and this is indeed a demonstrated experiment. If a small matrass of blown glass be filled with a boiling saline solution, the bowl of the matrass cracks as if it were water passing to the state of ice.

M. Longchamp sets forth that combination is possible only among bodies of analogous nature; then comparing cyanogen to chlorine, bodies whose analogy has long been acknowledged, he thinks that instead of concluding from it, as has been done, that cyanogen often acts like a simple body, from analogy it should be inferred that chlorine is a compound body.

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* *Comptes Rendus*, No. 8, Aug. 24.

ON THE ALTERATION OF TARTARIC, RACEMIC, CITRIC, MUCIC AND GALLIC ACIDS, BY THE PEROXIDES OF LEAD AND MANGANESE.*

BY M. J. PERSOZ.

M. Döbereiner was the first who made known the curious fact of the conversion of tartaric into formic acid, under the double influence of sulphuric acid and peroxide of manganese, which conversion has been explained by admitting that the sulphuric acid decomposes the peroxide of manganese into the protoxide, with which it forms a salt, so that one equivalent of oxygen is set free and combines with the elements of tartaric acid, converting them into carbonic and formic acids, according to the equation

$$3\,\mathrm{Mn\,O^2} + 3\,\dddot{\mathrm{S}} + \mathrm{C^4H^4O^5} = \left\{ \begin{array}{l} \mathrm{C^2H^2O^3} + \mathrm{Aq.} \\ \mathrm{C^2O^4} \\ \mathrm{H^2O} \\ 3\,\dddot{\mathrm{S}}\,\dot{\mathrm{M}}\mathrm{n.} \end{array} \right.$$

Considerations purely physical, and which I shall develope further on in my memoir, have induced me to rejcct this hypothesis, and to conclude that tartaric acid is alterable by a peroxide, without the aid of sulphuric acid. With a view to proving this proposition, I put one part of tartaric acid in contact with five parts of peroxide of lead and ten parts of water. The action took place at the ordinary temperature, and was manifested by an abundant disengagement of carbonic acid gas; the gas extinguished tapers, rendered lime water turbid, and was entirely absorbed by the alkalies. The liquor was boiled for a few minutes and filtered, in order to separate the insoluble portion, then evaporated and concentrated, so that, left to itself, it deposited crystals by cooling, some of which were transparent and prismatic, and some opaque and rhomboidal, but which, in both cases, contained only formic acid and oxide of lead.

With respect to the insoluble part, its nature varied according to the duration of the experiment, and likewise according to the quantity of peroxide used.

In the different experiments made to ascertain the action of tartaric acid on the peroxides, the insoluble part was found to be formed, sometimes of peroxide of lead and a certain quantity of tartrate of lead; sometimes of peroxide of lead and an equal quantity of carbonate and tartrate of lead; sometimes of the peroxide and a certain quantity of carbonate of lead; and sometimes of carbonate and tartrate, when an insufficient quantity of the peroxide had been employed. The following is the manner in which the nature of this residue was ascertained. After having perfectly washed it in order to free it from the formiate of lead with which it was impregnated, it was treated, with the aid of heat, and several times, by dilute nitric acid. When the residue was insoluble in nitric acid, it was nothing more than perfectly pure peroxide of lead. Indeed, 1 gr. of this residue, calcined and immediately converted into the sulphate, gave 1·26 gr. of sulphate of lead. The liquor, cautiously neutralised with ammonia, produced a precipitate, which, being well washed and treated by sulphuretted hydrogen, contained a quantity of tartaric acid corresponding to the tartrate of lead which was formed. This acid, thus extracted, exhibited all the properties assigned to tartaric acid, and had not undergone any modification.

In the case in which the tartrate of lead formed only part of the precipitate, the neutralised liquor contained only nitrate of ammonia; but it contained nitrate of ammonia and nitrate of lead, when, during the action of the tartaric acid on the peroxide of lead, carbonate of lead was formed. This last experiment, which clearly proves that tartaric acid may, by aid of peroxide of lead, be converted into formic acid, without the assistance of sulphuric acid, is nevertheless not sufficient to justify the proposition that we wish to establish, namely, that the alteration of tartaric acid by the peroxides, occurs by virtue of an action which occasions the very interesting phenomena of oxygenised water, and that it is independent of the supposed displacing of one equivalent of oxygen, for it might be objected to us that a portion of the tartaric acid would have the same action as the sulphuric acid, that is to say, that it would effect the decomposition of the peroxide by seizing the oxide of lead, and that the equivalent of oxygen of the peroxide displaced by the tartaric acid fulfils, in relation to the other portion of tartaric acid, the same part as the equivalent of oxygen displaced by sulphuric acid. This objection seems so much the better founded as the tartrate of lead is sometimes one of the products of the reaction. However, by a more attentive consideration of the phenomena of this action, there is found, in the very fact of the formation of the tartrate of lead, an argument in favor of our opinion. Indeed, if the alteration of tartaric acid by the peroxide of lead were subordinate to the previous displacing of one equivalent of tartrate of lead, the latter salt would necessarily always, and in uniform quantity, form one of the products resulting from the action which these two compounds exert on one another; now this is not the case, since, as we have said above, there are cases in which not a trace of tartrate has been found. If by this reasoning we have overcome the objection that might be made, the fact of the formation of the tartrate of lead does not the less exist, and ought also to be explained. Indeed, it is sufficient to bear in mind that one equivalent of tartaric acid requires three equivalents of peroxide of lead, in order to pass to the state of formic acid, and that in this case there are three equivalents of oxide of lead set free, only one of which enters into combination with the formic acid, whilst the remaining two remain free, or enter into combination with carbonic acid. Now, the tartaric acid in contact with the formiate and carbonate of lead, decomposes them, forming insoluble tartrate of lead, and liberating formic and carbonic acids. Thus, then, at least to admit, which cannot be, that the action of the peroxide of lead on the tartaric acid takes place on all points at once, the reaction of the tartaric acid and the peroxide should be represented as at first causing the formation of a certain quantity of basic formiate, which, in contact with the tartaric acid, is very soon after decomposed in order to be partially converted into neutral soluble formiate and into insoluble tartrate of lead. We may add, that if the latter salt is not always formed among the products of the re-action, if our opinion is correct, the tartrate of lead itself must undergo a direct decomposition on the part of the peroxide, which is proved by the following experiment. Equal parts of tartrate and peroxide of lead were boiled: an action took place which was rendered evident by the change in the state of saturation of the liquor, which soon became alkaline, and was rendered turbid on the contact of the air, depositing carbonate of lead. Filtered and evaporated, it deposited perfectly white crystals, which contained only oxide of lead, and formic acid, in the proportion of two equivalents of base to one of acid. This experiment clearly explains, therefore, how it happens that, by a more or less prolonged action, or by a sufficient or an insufficient quantity of peroxide of lead, with this latter compound and tartaric acid, may be obtained, sometimes tartrate and formiate of lead, sometimes basic formiate and carbonate of lead, and sometimes a mixture of these salts, and in variable proportions. Let us admit that an excess of peroxide of lead be made use of,—four equivalents, for example, to one of tartaric acid,—and that the action of these two bodies be stopped at the moment when the liquor ceases to be neutral, that is to say, when it begins to have an alkaline reaction in the liquor of the neutral formiate of lead, and in the neutral residue, will be found tartrate and peroxide of lead—compounds which may easily be separated by means of nitric acid. If, instead of thus stopping this action, it be continued, the tartrate soon disappears, and is replaced by carbonate of lead; the liquor holds in solution only basic formiate of lead, and the insoluble residue is then formed only of carbonate and peroxide of lead.

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* *Académie des Sciences*, Paris; Sitting of Sept. 21, 1840: from *Comptes Rendus*, No. 12.

After having examined the action of peroxide of lead on tartaric acid, we studied that of the peroxide of manganese on the same acid, and that by employing artificial and natural peroxide. In both cases the tartaric acid was converted into carbonic and formic acids, as with peroxide of lead. However, we may remark, that formic acid produced by the action of native peroxide of manganese is always accompanied by a coloring matter which becomes perceptible by being combined with oxide of lead, for the formiate which is thus obtained has a chamois tint, from which it is difficult to free it, and which does not affect the pure formiate.

Finally, wishing to ascertain whether the analogy between the peroxides of lead and manganese is longer sustained, and if the latter would be capable of altering the tartaric acid in tartrate of lead, we boiled one part of tartrate of lead with one part of peroxide of manganese; the liquor soon became alkaline, and we easily extracted from it, by careful evaporation, formiates of lead and manganese.

From the experiments detailed in this memoir, according to the author, it may be concluded:—

1st, That tartaric, racemic, and mucic acids, free, or combined with oxide of lead, are converted into carbonic and formic acids by the peroxides of lead and manganese, without the assistance of an acid.

2nd, That citric and gallic acids are also decomposed by the peroxides, but without producing formic acid.

After this Memoir was concluded, M. Biot remarked how desirable it was that the phenomena of decomposition which it treats of might be effected by means of soluble substances, diluted in transparent solutions. For tartaric acid possessing the rotatory power, and communicating it, with special modifications, to all the bodies with which it enters into combination, the mode and progress of its decomposition might thus be observed and followed in all their phases, as if they had become perceptible to the eye.

EXPERIMENTS FOR THE ACCURATE DETERMINATION OF THE ATOMIC WEIGHT OF CARBON.*

LETTER FROM M. DUMAS TO M. ARAGO.

Being obliged by ill health to pass a month at the waters of Aix, in Savoy, I take the liberty of addressing to you a Memoir, which M. Stass and myself wish you to present to the Academy. It is relative to the accurate determination of the atomic weight of carbon.

We have made fourteen experiments on this subject, and each of them with all imaginable care: they all agree. These experiments were performed by burning pure carbon, or well known compounds containing a large quantity of it. The combustion was carried on in oxygen, and care was taken to dry perfectly the gases obtained by chloride of calcium and sulphuric acid.

Thus dried, they traversed two absorption apparatus filled with *liquor potassæ*, and a third apparatus full of powdered potassa. The increase of weight of these three apparatus gave the weight of carbonic acid obtained.

Thus we knew the weight of the carbon burned, and that of the carbonic acid obtained, from which might be deduced, without any hypothesis, the proportion in which the bodies combine.

According to M. Berzelius, this proportion is 76·52 carbon.

According to our experiments, it is quite otherwise; for we find—

By the combustion of naphthaline, in four experiments :—

75·21,
75·01,
75·08,
75·07 :

By the combustion of camphor, in these experiments :—

75·1,
75·1,
75·0 :

By the combustion of benzoic acid, in two experiments :—

75·09,
75·06 :

By that of the natural graphite of Ceylon, in three experiments :—

74·91,
75·04,
74·99 :

By that of artificial graphite, extracted from iron graphite, in two experiments :—

74·87,
74·90.

All these numbers agree in showing, that the true atomic weight of carbon is 75, and not 76·52. There is, therefore, an error of 2 per cent. in one of the elements most indispensable to the formation of the formulæ at present employed in organic chemistry.

That is to say, that many formula must be modified, and many analyses again made, especially in what concerns bodies which are rich in carbon, where very serious errors may have been committed.

The Academy will observe with interest that this long and tedious series of experiments has brought us to the atomic weight proposed by Dr. Prout, who had long been of opinion that the atomic weight of carbon ought to be exactly equal to six times that of hydrogen. Now, indeed, $12·5 \times 6 = 75$,—the mean number of our results.

If, as Dr. Prout thought, and as now appears very probable, all the atomic weights are multiples of that of hydrogen, by entire numbers, there would be many things to be rectified in the atomic weights at present admitted. One ulterior experiment will decide on this point; but, from this time, it must be submitted to strict verification.

The Academy will also observe with interest that the atomic weight of carbon which results from our experiments, agrees much better than the old one with the analyses of the Iceland spar, of arragonite and marble, so carefully made by MM. Thenard and Biot, as well as with the densities of oxygen and carbonic acid determined by MM. Biot and Arago, and M. de Saussure, whose results resemble ours in that which relates to the combustion of carbon.

M. Boussingault has communicated to us some analyses of bitumen, which fully agree with our results.

ON THE PRE-EXISTENCE OF UREA IN URIC ACID.

Professor Gregory read to the Chemical section of the British Association a communication on the above subject. By the action of peroxide of lead on uric acid, Liebig and Wöhler obtained from it oxalic acid, allantoine, and urea, and they considered the latter as existing in the uric acid, combined with *urile*. The author having found that urea, unlike most organic substances, resists the oxidising agency of permanganate of potash, thought, if urea could be obtained from uric acid by the action of that salt, the argument for its pre-existence would be much strengthened, as, if only the elements of urea were present, the oxidising agency of the pèrmanganate would most likely prevent its formation. On trying the experiment a large quantity of urea was obtained along with oxalic acid, and a new acid, probably formed by the oxidation of allantoine. The author farther described the acetate of urea—a salt which was formed in the experiment.

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* *Académie des Sciences*, sitting of Aug. 17, 1840. From *Comptes Rendus*, No. 7.

ON A NEW METHOD OF CRYSTALLOGRAPHIC NOTATION.*

BY MR. J. J. GRIFFIN.

Mr. Griffin classes the planes of crystals into seven elementary sets, which he calls "Forms." The planes of crystallized minerals consist of these forms in various states of combination. Hence a natural crystal, crystallographically speaking, is a "combination." The seven fundamental forms are named P, M, T, MT, PM, PT, PMT. These symbols show the relation of the planes which constitute the forms to what are termed the axes of a crystal. These axes are three mathematical lines which cross one another in the centre of the crystal at an angle of 90°. The position of the first of these axes is perpendicular, whence it is called the principal or perpendicular axis, and is denoted by the sign p^a. The second axis is called the minor or middle axis, and is denoted by the sign m^a. It passes from the front to the back of the crystal. The third axis is the transverse axis. It passes from the left to the right side of the crystal, and is denoted by the sign t^a. All the planes of a crystal, when extended, cut one or two or three of these axes, and they are denoted by letters referring to the axes which they cut. Thus, P means two planes that cut p^a; M, two planes that cut m^a; T, two planes that cut t^a; MT, four planes that cut m^a and t^a; PM, four planes that cut p^a and m^a; PT, four planes that cut p^a and t^a; PMT, eight planes that cut all the three axes. When the axes are cut at different distances from the centre of the crystal, the lengths of the respective axes are indicated by indices placed between the letters which constitute the symbol of the form. Thus, $M\frac{1}{2}T$ denotes a vertical rhombic prism, the diagonals of whose cross section are as the numbers 1 and 2; and $P\frac{3}{2}M\frac{1}{2}T$ denotes a rhombic octahedron, whose three axes have the relation of $p^a_3 m^a_1 t^a_2$. Mr. Griffin entered into various details to prove that the occurrence of planes, not representable by one or other of these seven forms, was a mathematical impossibility, and that the proposed system of notation was amply sufficient for all the purposes of the chemist and mineralogist, while it had over other systems of crystallography the advantage of requiring but a small amount of mathematical knowledge.

NEW METHOD OF ANALYSING SULPHUROUS WATERS.—IODINE AS A TEST FOR HYDRO-SULPHURIC ACID.—SULPHO-HYDROMETER.†

BY M. ALPHONSO DUPASQUIER.

Being occupied in making a complete history of the fine establishment which has lately been founded near the sources of Allevard, (Isere), M. Dupasquier has devoted himself, with peculiar care, to the analysis of the sulphurous water which they so abundantly yield. He has studied it very accurately, and his investigations have led to the discovery of a process, as simple as delicate, for detecting and ascertaining the proportion of hydro-sulphuric acid, free or combined, contained in mineral waters.

Tincture of iodine, poured into a liquor impregnated with hydro-sulphuric acid, completely decomposes that acid, and so instantaneously, that it is very easy to ascertain the point at which its decomposition is finished, and when the iodine no longer enters into combination. Setting out from this observation, which is his own, it occurred to M. Dupasquier that by using a carefully prepared tincture of iodine, he might be able, from the quantity of iodine required for saturating a quart of sulphurous water, to deduce the proportion of free or combined hydro-sulphuric acid which it contained.

This opinion has been confirmed by experiment, and M. D. has rendered his new method of analysis extremely convenient, by means of an instrument which he calls a *sulpho-hydrometer*.

This instrument is a graduated tube filled with tincture of iodine, one extremity of which is closed by a cork, whilst the other is tapered, and terminates in a capillary aperture which allows the tincture of iodine to run out, drop by drop, when the cork is removed.

To use the sulpho-hydrometer, a given quantity of sulphurous water is poured into a porcelain capsule; a few drops of a very clear solution of starch are then added; then the tincture of iodine is gradually dropped into it, taking care to assist the action by stirring. So long as any traces of hydro-sulphuric acid remain, the iodine deprives it of hydrogen, precipitating its sulphur, and immediately disappears, without coloring the starch: but from the time that the saturation is complete, the least trace of free iodine is sufficient to communicate to the liquor a fine blue color. The number of degrees that the tincture of iodine is lowered in the sulpho-hydrometer, must then be reckoned: each degree represents 1 centigramme of iodine, and each tenth of a degree, 1 milligramme. The quantity of iodine necessary to saturate a quart of sulphurous water being thus given, it is very easy to ascertain how much hydro-sulphuric acid the water contained, by determining the equivalent of the iodine in the hydrogen, the volume of which being known, we have that of the hydro-sulphuric acid.

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* British Association, meeting at Glasgow, Sept. 1840, as given in *The Athenæum*.

† *Annales de Chimie et de Physique*.

To render the use of his instrument more easy, M. Dupasquier has prepared a table, indicating in weight and bulk, the quantity of hydro-sulphuric acid, represented by 1, 2, 3, &c., 100 centigrammes, 1, 2, 3, &c., milligrammes of iodine.

This mode of analysis, independent of giving results of the strictest accuracy, has also the advantage of being so expeditious, that 15 or 20 experiments may be made in less than an hour. It is also so simple, that it is not necessary to be a chemist to determine the proportion of hydro-sulphuric acid contained in a mineral water: any intelligent person may ascertain the variations in the strength of sulphurous waters, caused by atmospheric influences, or by the mixture of rain water. Among other advantages which this method presents, M. Dupasquier holds up to notice its extreme delicacy, which is so great, that it indicates the precise quantities of hydro-sulphuric acid in waters on which other reagents would have no action, although they evidently exhibited a sulphurous character. Tincture of iodine may, indeed, he has ascertained, unequivocally detect one drop of a concentrated solution of an alkaline hydro-sulphate, diluted in a hectolitre of water, whilst known reagents become powerless when it is diluted in 10 quarts.

ON CHEMICAL GEOLOGY.*

BY PROFESSOR JOHNSTON.

Professor Johnston stated the substance of the paper he had given in, on the subject of chemical geology. He confined himself to the consideration of the coal formation. He took it for granted that coal is derived from vegetable substances, and proceeded to consider the character and action of the agents at work in the process of its formation. He discarded the names employed by some geologists to describe the different characters of coal, such as caking, bituminous, &c., and as carbon, hydrogen, and oxygen are the components of all vegetable matter, he proposed to describe the various characters of coal by a chemical mode of notation, indicating the relative proportions of these qualities in coal. Thus, the Newcastle caking coal, and anthracite Welsh coal, were described as follows:—

	Newcastle coal.	Welsh coal.
Carbon . . .	89·19	94·05
Hydrogen . .	5·00	3·38
Oxygen . . .	5·81	2·57
	100·00	100·00

He proceeded to show that it is the peculiar province of chemistry to inquire into the means by which coal is produced from vegetable matter. He then described the process of decomposition which takes place under the united influence of water and atmospheric air. Different kinds of coal, he showed, were not derived from different kinds of wood or vegetable matter; but, in reality, all of them were steps in the descent from highly organised matter to a state, as in the anthracites, where organic structure altogether disappears. Coal was, therefore, derived from vegetable matter, in obedience to a general law. The learned professor, in concluding, referred to the arguments against the opinion that the wood of the coal formation was drifted in water to the places where they were deposited. The evidence on this point, he confessed, inclined him to the belief that the trees had grown on the spot. One argument was this: some of the coal of the Newcastle fields, for instance, was found so pure as to contain not more than one-half per cent. of silt or foreign matter; how, then, could masses of wood be transported to their present beds without a very great mixture of clay or sand? Another argument was, that over a large area the coal was only one inch thick. In other cases there were different kinds of coal overlaying one another in alternate layers, but so different in quality, that the miners could dispose of the whole of one seam as fast as they could work it, whereas the next seam might not be worth disposing of at all. In other cases there was observable a regular stratification. All these arguments were urged by intelligent miners against the theory which assigned the coal formation to drifted trees. Without giving any positive opinion on this point of the subject, he would merely say, that on a weighing of the evidence on both sides, he thought the balance was in favor of the idea that the vegetable matter grew upon the spot.

Dr. Buckland held the views propounded by Professor Johnston to amount almost to a demonstration, and regarded them as an epoch in the investigation of the origin of coal. The argument against drifted trees might be true, as far as it went; but it was not true altogether. He believed that other beds of coal were the result of vegetable matter drifted from great distances. Instances of this kind were clearly proved by the pine found in Craigleith quarry, and other fossil trees imbedded in sand, and completely cut off from the ground below. The truth probably lay between extreme views on both sides.

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* *British Association.*

ON THE DECOMPOSITION OF GLASS.*

BY SIR DAVID BREWSTER.

Sir D. Brewster read a very interesting paper upon the decomposition of glass. He had formerly brought the subject before the Association; and since that time he had got two specimens of glass—one from Italy, and the other from St. Andrew's—of which the character had been entirely changed by decomposition. Sir David then described the mode of decomposition. It began at certain points, and extended over the surface, either in planes, or in concentric films, affording colours of surpassing beauty. In one of the specimens, the siliceous portions had separated from the metallic, and had arranged themselves in alternate circles around the first point of decomposition. This liability to decomposition Sir D. feared might produce serious results to science, as some of the finest glasses of scientific instruments were exhibiting symptoms of decay.

Professor Forbes thought the softness of the glass used was more the cause of decomposition than atmospherical influence.

Sir David then described several curious effects produced by the polarisation of light by decomposed glass.

ON THE SOLUBILITY OF SILICA BY STEAM.†

Mr. Julius Jeffreys, late of the Hon. E. I. C. Medical Establishment, communicated a paper to the Royal Society during the past session, giving an account of an experiment on the subjects of which the following is a digest:—

The inner surfaces of a flue built of siliceous bricks, appeared to be deeply eroded by the passage over it of steam at a very high temperature, and fragments of siliceous materials laid in the course of the current, were partially consumed. A siliceous crust was deposited on several vessels of stone-ware, coated with a micaceous glaze, placed in the upper part of the furnace, and this crust was re-dissolved when the vessels were removed to a hotter situation in the same furnace. The author noticed the experiments of Dr. Turner and others, which failed in showiug the solubility of silica by steam, in consequence, as he conceives, of the heat not having been sufficiently great to effect the solution.

CHEMICAL ANALYSIS OF ARCHIL AND OF LITMUS.‡

According to the recent investigations of Dr. Kane, read before the Royal Society, he finds in the lichen *Roccella tinctoria* the following bodies either pre-existing in the plant or formed during the process employed for its analysis. 1. Erythroline; 2. Erythrine (the Pseudo-erythrine of Heeren); 3. Erythrine bitter; 4. Telerythrine; and 5. Roceline (the Roccellic acid of Heeren). He finds the *Archil* of commerce to consist essentially of three ingredients, viz. 1. *Orceine*, 2. *Erythroleic* acid, and 3. *Azoerythrine;* of each of the two former there exist two modifications, and there is in addition a yellow matter.

His inquiries into the constitution of ordinary litmus, lead him to the conclusion that that substance contains the principles designated by him as—1. *Erythroline*, 2. *Erythrolitmine*, 3. *Azolitmine*, and 4. *Spaniolitmine;* and that the coloring constituents of litmus are, in their natural condition, red; the blue substances being produced by combination with a base, which bases in that of commerce are lime, potassa, and ammonia, and there is mixed up in the mass a considerable quantity of chalk and sand.

NEW WORKS ON CHEMISTRY.

Instructions for the Multiplication of Works of Art in Metal, by Voltaic Electricity. With an Introductory Chapter on Electro-Chemical Decompositions by Feeble Currents. By THOMAS SPENCER. Glasgow: R. Griffin and Co.; and Tegg, London.

This work, which forms No. IV. of Griffin's Scientific Miscellany, is one of the highest importance. The art of Electrography, as Mr. Spencer terms it, has, owing more especially to his own labors and discoveries, made rapid strides towards perfection. With the assistance of his ingenuity and industry, together with that of the endeavours of other and very eminent scientific men who are now investigating this subject, we are of opinion that this very beautiful art will, ere long, be rendered of the most general practical utility. We heartily wish these gentlemen success in their endeavours.

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* *British Association.*

† *Proceedings of the Royal Society,* 1839-40.

‡ *Proceedings of the Royal Society,* 1840.

The work before us is a very able and comprehensive detail of the various Electrographical processes: the introductory chapter on electro-chemical decompositions by feeble currents, alone is sufficient evidence of the author's knowledge of the subject.

We may conclude this notice by recommending this work to the careful perusal of our readers, and by giving the following extract from the Preface:—

"When we take into view the fact that every form of matter we are acquainted with is saturated in definite proportions with this wonderful power, lying, as it were, dormant, but never under any circumstances refusing to be drawn forth to perform its functions, when the proper means are applied; and when we recollect that it can never be dissipated,—the force, it is true, may be misapplied by ignorance, but not wasted,—that it fulfils its assigned office during its passage from one body to another, from whence it may be again and again recalled with definite, yet undiminished vigour. When we also take into consideration that scientific men, in every quarter of the globe, are at this moment running a race with each other, vieing who shall be the first to make another useful application of this principle; and that the battery is rapidly becoming a tool in the workshop, and an instrument in the surgery;—with these facts before us, surely little doubt can be entertained that we are on the threshold of still greater improvement.

"It might be expected that this work should have been illustrated by the process it describes. Under other circumstances it would have been so: electricity is now capable of performing tasks of greater difficulty; but, in the present instance, it would have rested with myself to have done it, the manipulation of the process not being sufficiently known to the engraver, although rapidly becoming so, and my own spare time has been occupied with subjects which I have deemed of more importance than the drudgery of repeating experiments, with the results of which I was already acquainted. Within the last year I have sent specimens to the public, exhibiting its capabilities in every ordinary department of art; and a repetition of this from me is surely uncalled for, my object being fully attained when the best and most expeditious method has been pointed out.

"Latterly, I have seen voltaic copies of large engraved copper plates, exhibiting the most minute and microscopic lines, with all the fidelity of the originals; even the burnished appearance of the surface, which, under other circumstances, they never could have acquired, but from the peculiar friction given to them by the hand of the workman. These may be multiplied *ad infinitum.*

"There are few branches of manufactures in any way connected with art, that will not benefit by the adoption of this principle. Already it is in active operation among calico printers. Potters can now afford to pay for the highest art to design and engrave one plate, as they may have any number of duplicates equal to the original, at little more expense than the price of the copper. The copper matrix for type founding, however elaborate, may now be produced with the greatest facility, and at a trifling expense.

"Wood engravings may now be copied in copper to any extent, and the finer lines which could not be obtained in the originals, may be put into the copper fac-similes with facility. Even in stereotyping, it may ultimately be found as economical as the method in common use, and certainly much better.

"Elegant designs are deposited on plates in relief, from which embossed cards are printed; in short, there is scarcely a department connected with the elegancies and refinements of life, where I do not hear of its application; but since I discovered an efficient method of metallizing the surface of non-metallic substances, a copper statue may be taken from a plaster of paris mould, in little more time than would be required to deposit the same thickness on a metal.

"Few who watch the progress of events can doubt, that had this discovery not been made at the present period, a very brief additional time would have brought it under public attention. Scientific facts were all tending toward it. The great discoveries of the last age were being condensed and combined into the elements of learning for this. Trains of scientific thought which had been long and curiously laid, only required the aid of the match to explode them simultaneously.

"In this little work I have laid the experience I possess on this branch of scientific art before the public, but doubt not that a few years in the hands of the many will improve it. It is true I have been a long time occupied with the subject, but it must be taken into consideration, that my means of cultivating science are limited, the hours it occupies being stolen from those usually set apart for relaxation and rest, my ordinary avocations being of a laborious nature; yet I have felt so much gratification in the pursuit, so much exquisite pleasure at the results of successful experiment, that I consider my own reward as ample."

Descriptive Account of some New Instruments, and of some Eudiometric Apparatus, recently invented. By Charles Thornton Coathupe, Esq. of Wraxall, near Bristol.—London: Ball, Arnold & Co.—Bristol: Philp and Evans.

This work is dedicated "To All Lovers of Scientific Investigation," and is well worth their attention. The new instruments are for correctly graduating glass tubes for Eudiometrical and other purposes, and are well illustrated by very neatly executed plates with copious references. We are of opinion that these instruments will be found far more accurate than any at present in use.

The Eudiometric Apparatus consists of a New Eudiometer, and a tube for estimating the quantity of carbonic acid gas in deteriorated atmospheres, invented by Mr. Coathupe. They are very useful instruments, and very simple in their construction and mode of use.

We regret being unable to give an extract from this work: we feel that nothing we may say can give a just idea of the merits of the instruments described in it, and we therefore recommend it to our readers: they will be best able to judge for themselves.

II. CHEMICAL MANUFACTURES.

ON THE MOST IMPORTANT CHEMICAL MANUFACTURES CARRIED ON IN GLASGOW AND ITS NEIGHBOURHOOD.*

BY PROF. THOMAS THOMSON, OF GLASGOW.

Glasgow being the seat of a great many interesting and important chemical manufactures, it occurred to Professor Thomson, that it might be of advantage to those members of the Chemical Section, who came from a distance, to give a short catalogue of the most important of these manufactures, that they might know what the information is which they may expect, and where they are to seek it.

I. Iron.

The smelting of iron has been carried on in the neighbourhood of Glasgow, for above fifty years. The late Mr. Dunlop, of the Clyde Iron Works, informed me, that when he first became proprietor of those works, the produce was but fourteen tons a-week, or 728 tons a-year; and at that time, I rather think, there were no other works in the neighbourhood. At present the quantity of iron smelted in Glasgow and the neighbourhood cannot be much less than 200,000 tons or nearly a fifth part of the whole iron smelted in Great Britain. Mr. Dixon has extensive iron works in the suburbs, on the south side of the river, and the Clyde Iron Works are situated on the banks of the river, and about four miles to the east; but the great seat of the iron works is the neighbourhood of Airdrie, or rather Coltsbridge, about nine miles east from Glasgow, but connected with the city by the Monkland canal and the Garnkirk railroad. The ore from which the iron is smelted, is the carbonate of iron, or clay iron-stone, as it is usually called by mineralogists. This ore is very abundant all round Glasgow, and especially in the neighbourhood of Airdrie. Fortunately for the smelters, the iron-stone and coal beds are associated together, the iron-stone either occurring in boulders or beds along with the coal.

The rapid increase of iron smelting has been the consequence of a discovery made by Mr. Neilson, manager of the gas works. This is now universally known under the name of the hot blast. The air is heated to more than 607° before it enters the furnace, by passing through a range of heated pipes. Under this treatment, it is found, that the coals may be used without previous coking; and that instead of seven tons of coals for every ton of cast iron, three tons or even two tons and a half will be sufficient. There is also a diminution in the quantity of limestone necessary, and the produce of iron per week from the same furnace is considerably increased. It is said, that neither in Staffordshire, nor in Wales, is the hot blast attended with the same saving of fuel. Till of late years, no bar iron was made in Scotland, the smelters confining themselves to cast iron. About three years ago, Mr. Dixon commenced the manufacture of bar iron near St. Rollox, but, after some time, he abandoned the manufactory. It is now conducted on a great scale by Mr. Wilson, at Dundyvon, and by Mr. Dixon, at Glasgow, and perhaps by other iron-masters. The heat raised in the puddling furnace is much greater than it was in Staffordshire, when I witnessed the process there about twenty-five years ago.

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* *British Association.*

At Holytown, not far from Airdrie, there is an interesting manufactory of steel, where melting and casting steel may be seen: the heat necessary for this process is greater than for any other. It is curious, that the clay in the neighbourhood perfectly answers for making crucibles for cast steel; but it does not answer so well as Stourbridge clay, for making glasshouse pots. On analyzing the two clays, we found that the Garnkirk contained much more alumina and less silica, than the Stourbridge; showing that glass in fusion acts more powerfully on alumina than on silica.

II. Sulphuric Acid.

Another manufacture of importance, and which is indebted to Glasgow for the state of perfection which it has reached, is that of *sulphuric acid*. It was begun by Dr. Roebuck, at Prestonpans, about the year 1763, but it is not more than twenty years since his manufactory was abandoned. The sulphuric acid works, at St. Rollox, on the banks of the Monkland canal, were begun about forty-five years ago. They were at first upon a very small scale, though now probably are the largest of the kind in Europe. Dr. Roebuck's method was to mix together sulphur and saltpetre, and after setting the mixture on fire, to introduce it into a leaden vessel or chamber, at the bottom of which there was a quantity of water. This method was not economical. A portion of the sulphur would unite with the potassa of the saltpetre, and form with it a sulphuret, and probably a portion of the sulphuric acid formed, would also unite to the potassa and form a sulphate.

When Messrs. Knox, Tennent, and Macintosh established their works at St. Rollox, they separated the sulphur from the saltpetre; the sulphur was burnt over a stove; and an iron cup containing the requisite quantity of saltpetre, mixed with the requisite quantity of sulphuric acid, was placed over the burning sulphur. By this contrivance the sulphur was completely converted into sulphurous acid, and the whole of the nitric acid carried along with it into the leaden chambers. The size of the leaden chambers was gradually increased, and the substitution of steam for the water formerly placed at the bottom of the chambers, was a great improvement. The acid which collects at the bottom of the chambers has now a specific gravity of 1·75, or it is a compound of one atom anhydrous acid, and two atoms water. This acid is concentrated by heating it in a platinum still, till the second atom of water is driven off. When this manufacture is at full work, the quantity of sulphuric acid made in it exceeds 300,000 lbs. avoirdupois per week. When I first began to purchase sulphuric acid, about forty-five years ago, it cost 8*d*. per pound; the price is now under a penny a pound.

III. Bleaching Powder.

One of the great purposes to which sulphuric acid is applied at St. Rollox is, the manufacture of *bleaching powder, or chlorite of lime*, as it is now called. When the mode of bleaching by chlorine was introduced into Great Britain, by Mr. Watt, in 1787, the very offensive smell and deleterious effects of that gas upon the workmen, was a formidable objection to its use. Various methods were tried to remove this objection. It was found, that if potash or soda was dissolved in the water before it was impregnated with the chlorine gas, the disagreeable smell was destroyed; but, unfortunately, this addition destroyed at the same time the bleaching power of the gas. Messrs. Knox, Tennent, and Macintosh at last discovered, that if lime were mixed with the water before it was mixed with the gas, the disagreeable smell was done away with, and the bleaching power still remained uninjured. They took out a patent for this discovery; but it was infringed upon by the Lancashire bleachers, a lawsuit was the consequence, and the patent was destroyed. It was then that Mr. Macintosh tried, whether chlorine would not be absorbed by slacked lime. The trial succeeded: a compound was formed, which readily dissolved in water, and the solution of which possessed great bleaching power; a patent was taken out for the manufacture of this dry powder, which the patentees distinguished by the name of bleaching powder. This patent was not infringed; the sale of it was at first small, and it was overlooked by the bleachers. The consequence was, that the patentees had leisure to perfect their method of preparing it, and to become able to sell it at so low a price, that it gradually superseded all the old methods of bleaching by chlorine.

The process may be seen at St. Rollox in great perfection, and on a very large scale.

The requisite mixture of common salt, binoxide of manganese and sulphuric acid, is put into a leaden still, and the chlorine evolved passes through leaden tubes into air-tight stone chambers, the bottoms of which are covered with a stratum of slacked lime several inches thick. The lime absorbs the gas as it passes into the chamber, and the process is continued till the absorption is reckoned sufficient. Bleaching powder, supposing it pure, is a compound of

1. Chloride of calcium . .	7
2. Chlorite of lime	10
3. Water	3·375
	20·375

Half the lime loses its oxygen, and combines with chlorine, constituting chloride of calcium. The oxygen combines with chlorine, which, in the state of chlorous acid, combines with the other half of the lime, constituting chlorite of lime. Two atoms of the water were in the slacked lime. The third atom must have come along with the chlorine gas, or been absorbed from the atmosphere.

IV. SODA.

After the chlorine has been extricated, there remains in the still a semi-liquid mass, consisting partly of the impurities of the manganese, and partly of sulphate of soda and sulphate of manganese. If the manganese were pure binoxide, and only the quantity of salt and sulphuric acid necessary for the decomposition were used, the sulphate of manganese (abstracting the water) would weigh nine and a half, and the sulphate of soda, nine. But in order to save the stills by producing the decomposition with little heat, twice as much sulphuric acid is used as is necessary, and this excess is afterwards saturated by means of common salt; so that the quantity of sulphate of soda in the residue is at least twice as great as that of the sulphate of manganese.

To get rid of the sulphate of manganese, the residue from the stills is fused in a reverberatory furnace at a red heat; this drives off the sulphuric acid, and leaves the manganese in the state of sesquioxide. The whole is dissolved, and the insoluble manganese thrown away. The solution of sulphate of soda is evaporated to dryness, mixed with small coal, and fused again. This destroys the sulphuric acid, and converts the soda into sulphuret. This sulphuret of soda being mixed with saw-dust, &c., and exposed to an incipient red heat, the sulphur is driven off, and carbonate of soda remains, which is obtained in crystals by solution and crystallization, or in the state of *soda ash*, by a more rapid process.

The theory of the last step of the process, in converting the sulphate of soda into carbonate, is not very obvious, and would require an experimental investigation to throw light on it. But my object at present is not to theorize, but to state facts.

V. ALUM.

Another chemical manufacture, which may be seen, is *alum making.* There are two establishments, one at the Hurlet, about six miles south-west, by the Paisley canal; another at Campsie, about eight miles off, near Kirkintulloch, on the Great Canal, and near the foot of the Campsie Hills. The alum is made from the *shale*, which exists in great abundance in the exhausted coal beds. This shale is a clay mixed with some coal, and with that variety of iron pyrites, which undergoes decomposition, and is converted into sulphate of iron by exposure to the air. The sulphate of iron, thus formed, slowly acts on the clay, and in process of time converts it into sulphate of alumina. The alum maker washes this altered shale, and obtains a solution of sulphate of iron and sulphate of alumina. When sufficiently concentrated and cooled, the liquor yields an abundant crop of sulphate of iron, which is removed, dried, and sold at a cheap rate. The sulphate of alumina does not crystallize till it is mixed with sulphate of potassa or sulphate of ammonia; because alum is a double salt, composed of three atoms of sulphate of alumina and one atom of sulphate of potassa, or sulphate of ammonia.

Formerly nothing but chloride of potassium, bought from the soap-makers, was used. But of late years (at least at Hurlet) sulphate of ammonia, from the liquor obtained during the preparation of gas, has been employed. In general, the alum made at Hurlet contains both potassa and ammonia; but the manufacturer can supply it free from potassa. Such alum is convenient to chemists, because when it is heated to redness everything is driven off except pure alumina. At Hurlet and at Campsie, the mode of concentrating the liquid by a current of heated air passing over its surface, deserves attention.

VI. PRUSSIATE OF POTASSA.

At Campsie alum works another interesting chemical manufacture may be seen, the fabrication of prussiate of potassa, a beautiful well known yellow salt, which crystallizes in truncated octahedra. It was here that the manufacture of this salt, on a great scale, first began. Before that time it was only prepared in laboratories for scientific purposes, and sold at a high price. Mr. Mackintosh introduced it to the calico-printers, who use it extensively, to produce very beautiful blues and greens. It is prepared by burning the hoofs and horns of cattle in iron pots, along with a quantity of potassa. The hoofs and horns of a hundred head of cattle are consumed every day in the works. For some time no iron was added, the requisite quantity for forming the salt being corroded from the pots during the combustion. But the last time that I visited the works, I found that iron was mixed with the hoofs, &c. during the combustion. The residue after this combustion is lixiviated with water, and when the solution is sufficiently concentrated, the prussiate of potassa crystallizes.

Connected with this manufactory of prussiate of potassa, is another of Prussian blue.

It is made by mixing sulphate of iron, alum, and prussiate of potassa, and precipitating the whole by an alkali. The precipitate is at first light blue. But it is washed with new portions of water every day, for several weeks. At every washing the colour deepens, and when it has acquired the requisite shade, the Prussian blue is allowed to subside, the water is drawn off, and the powder allowed to dry. The colour varies according to the proportion of alum employed, and it has the finest colour of all, with the coppery lustre which is so much admired, when no alumina whatever is mixed in it.

VII. Bichromate of Potassa, &c.

Another beautiful chemical product may be seen at Shawfield, near Rutherglen, about two miles from Glasgow, in the manufactory of Mr. White—I mean *bichromate of potassa*, a salt very much used by calico-printers, and forming the finest and most indelible yellows, oranges, and greens. Its introduction constituted quite an era in calico-printing. This salt was originally made by heating chromic iron ore with saltpetre, dissolving out the chromate of potassa, and adding the requisite quantity of nitric acid to deprive the chromic acid of half its potassa. When this process began, the salt was sold at a guinea an ounce. But now, when the price is as low as two shillings a pound, it is necessary to prepare it by a cheaper method. It has been found that common potassa of commerce may be substituted for saltpetre; and I believe the manufacturers now contrive to form the bichromate at once, without requiring the use of an acid, which would nearly double the expense. I believe all the bichromate used by the calico-printers is made here and in Liverpool. In the same manufactory may be seen a beautiful product;—I mean tartaric acid, which is used by the calico-printers to a large amount, chiefly for disengaging the chlorous acid from bleaching powder, and enable it to destroy the colour on particular parts of the cloth, either that these parts may remain white, or that some other colour may be superadded. Tartaric acid is obtained from cream of tartar, by throwing down the tartaric acid by means of lime, and afterwards decomposing the tartrate of lime by means of sulphuric acid, and crystallizing the tartaric. At the same manufactory may be seen a pretty and simple process, by which the carbonate of soda is converted into the sesquicarbonate. By simply exposing it dry and in powder, in an atmosphere of carbonic acid gas, it absorbs the requisite quantity to be converted into sesquicarbonate. And this sesquicarbonate is chiefly used by the makers of soda water.

VIII. Acetic Acid.

It is hardly proper to mention the manufactory of acetic acid from wood, which has been carried on for many years by Mr. Turnbull, because the first part of the process is, I believe, carried on at a distance, for the sake of the wood—I mean, the distillation of the wood. To free the acetic acid from the tar, which destroys its flavour and taste, the acid was combined with lime, and the acetate of lime thus formed is exposed to a heat sufficiently high to char the foreign bodies with which it is impregnated, the acetic acid being capable of resisting a higher temperature without decomposition than most compound vegetable bodies. The acetate of lime, thus free from impurities, is decomposed by sulphuric acid, and the acetic acid obtained by distillation. By this process it may be obtained very strong. I have it composed of one atom acetic acid, and one atom water. When of this strength, it crystallizes in winter, but becomes liquid again in summer. In the same manufactory there is another liquid prepared, namely, *pyroxylic spirit*, now well known.

A most interesting set of experiments on it has been made by Dumas, who has distinguished its basis by the name of *methylene*, and has discovered many new compounds which it is capable of forming.

IX. Iodine.

Another chemical manufacture of considerable importance, and which I believe to be peculiar to Glasgow, is *iodine*.

A few years ago, there were no fewer than ten manufactories, in each of which it was made to considerable extent; but as iodine is only used in medicine, the sale is limited, and I believe that most of these works are now abandoned. The process followed by all the makers was, I believe, that contrived by Mr. Mackintosh. Iodine is obtained from kelp, and it deserves attention, that those kinds of kelp which contain most potassa contain, at the same time, the most iodine. The kelp is lixiviated, and all the salts that can be extracted from the solution by evaporation are separated. The supernatant liquor remaining is mixed with an excess of sulphuric acid. A great quantity of sulphuretted hydrogen is evolved, the bad effects of which on the workmen are prevented by setting it on fire, and allowing it to burn as it is extracted from the liquid. To the liquid thus freed from sulphuretted hydrogen and from muriatic acid, a quantity of binoxide of manganese, equal in weight to the sulphuric acid employed, is added. The whole is put into a leaden still, and heated to a temperature which must not exceed 190° or 200° at most. The iodine passes into the receiver, which consists of a series of spherical glasses, having two mouths opposite to each other, and inserted the one into the other.

X.. Soap.

It may seem superfluous to mention *soap*, because it is a manufacture universally known: but soap of a very superior quality is made in Glasgow. The number of soap works amounts to seven, and one of these, that at St. Rollox, is the third, if not the second, in point of extent, in Great Britain.

The ingredients of soap are soda, tallow, and rosin, and sometimes palm oil. Only two kinds of hard soap are made here, namely, *yellow* and *white*. The yellow soap is made by boiling 9·75 cwt. of tallow, 3·25 cwt. of rosin, 4 cwt. of soda ash, equivalent to 2 cwt. soda, mixed with the requisite quantity of water. The white by boiling 13 cwt. of tallow, 4 cwt. of soda ash in the same manner.

Tallow, which is a compound of two oily acids and glycerine, undergoes decomposition, and the soda combines with the acids, and forms soap. When the combination is complete, a quantity of common salt is put into the hot liquor. It dissolves in the water, and the soap separates, and swims on the top. It is now allowed to cool to 150° at an average, and is then taken out in a liquid state, and poured into frames, where it is allowed to become solid, and then cut into the usual parallelopipeds, or wedges, as they are called. It is customary, during the *cleansing* of the soap, as the pouring it into the frame is called, to mix it with a quantity of caustic soda ley. The soap made in Glasgow is usually a compound of—

1 atom oily acid	..53	or per cent.	74·6
2 atoms soda	 8	,,	11·2
9 atoms water	..10·125	,,	14·2
	71·125		

White soap is cleansed at the average temperature of 181°. Its constitution is precisely the same as that of yellow soap.

XI. Bleaching of Cotton.

Bleaching of cotton cloth is carried on here to a great extent. It consists of four processes:—1st, The goods are boiled with lime, at a temperature above the boiling point of water. The process is curious, and deserves to be seen. 2nd, The cloth is steeped in a solution of bleaching powder. 3rd, It is boiled with caustic soda or potash. 4th, It is steeped in water acidulated with sulphuric acid.

XII. Turkey Red Dyeing.

Turkey red dyeing has been practised here for nearly half a century.

XIII. Calico Printing, &c., &c., &c.

I need hardly mention *calico printing*, which is carried on here to a great extent; *glass-making*, which is carried on here or on the Clyde in all its branches; *starch-making*, of which there is only one manufactory. The manufacture of the dye stuff called cudbear, employed in dyeing red, has long been carried on here; so has the distillation of spirits, and the manufacture of ether.

ON THE MANUFACTURE AND ADULTERATION OF GIN.

BY CHARLES WATT.

Among the various articles of general consumption, there are none which undergo more extensive and dangerous adulteration than gin.

As our readers are not, perhaps, acquainted with the mode in which this peculiar compound is manufactured, it may not be digressing too far, to give them a brief account of its production, and then to shew the materials and manner of adulteration.

By the excise laws of this country, the malt distiller, and the "rectifier and compounder," are not allowed to carry on their respective businesses within a certain distance of each other, in order to prevent an illicit intercourse and co-operation between them. The malt distiller first forms the spirit by making a wort—as it is termed—of equal parts of malt and barley, ground and mixed with a certain quantity in a mash-tun. When left to digest for some days, the wort is drawn off into the fermenting tun, and so soon as it is reduced to the temperature of about 70°, a quantity of brewers' yeast is added, and after well stirring the mixture, the fermentation commences, and continues until all the saccharine matter is converted into spirit, which is known by the cessation of fermentation: it is now called a wash.* This is then removed into the still, and the spirit is brought over; when this is done, it is sent to the rectifier and compounder, who, with a mixture of a certain quantity of coriander seeds and bruised juniper berries, puts it into the still, and allows the spirit to run off until it has attained a certain point of strength, which is indicated by the hydrometer.

In this state it comes into the hands of the dealer, who, if carrying on his business respectably, merely flavors it and adds a certain quantity of water,—which it is impossible to detect by the hydrometer, in consequence of the addition of sugar,—and sells it at a corresponding rate.

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* This occupies two or three days.

The flavoring mixture is composed of sugar, spirit of turpentine, powdered angelica root, and elder-flower water; a little essential oil of lemon is also added. This constitutes the common gin as sold at houses of good repute.

In houses where it is sold in an adulterated state, it is first very largely diluted with water; then it is mixed with capsicums, sulphate of zinc, &c., and an extra quantity of turpentine to make it produce on the palate an artificial sensation of heat; and we understand even ligneous naphtha and other powerful agents are sometimes used, in order to give to the palate the sensation of ardent spirit. Such practices require the vigilant attention of the Excise, and a careful examination of the suspected liquor. The means of detecting vegetable stimuli, such as those in capsicum and bird pepper, are first to evaporate all the alcohol; if the residual liquid contain them, it will give the powerful sensation peculiar to these substances, when applied to the tongue. In this state it is consumed by those who are not able to control their propensity to so deadly a vice as drunkenness.

From the foregoing statement it will be seen that we have in this spirit a compound of alcohol with the most powerful and injurious substances. It may, we will admit, be urged that the smallness of the quantities of the more noxious ingredients is such as to have a very trifling effect. Feasible as this may appear when abstractedly considered, we have good reason to believe that such compounds, when so often taken internally, are highly injurious to the digestive organs; indeed, if homæopathy has any foundation, the smallest divisions produce, by continued action, the most powerful effects. Be this as it may, we can have no doubt of their bad effects when perpetually introduced into the system. Let us but for a moment reflect on the injury to those important organs through which they pass: every action in these organs must be affected, and their functions become deranged, until at length permanent disease supervenes. We are convinced that no part of this compound is so injurious as the ardent spirit it contains. Who has not witnessed its devastating influence on "mind, body, and estate?"—The premature old age—the disease of the liver and other vital organs—the palsied hand—the *delirium tremens*—paralysis, imbecility and insanity—the vice, profligacy and crime—the abject poverty, filth, and neglect of home, family and business — present appalling and melancholy evidence of the loathsome sad practice of drinking, and afford an irrefutable proof of its sad results. Yet as we see the victims of this horrid vice holding in detestation and enmity those honourable individuals, who, with the deepest solicitude for the welfare of their poorer neighbours, sacrifice much time and incur much trouble, with the sole intent and hope of redeeming them and their families from destruction, and under the deepest conviction of the truth of the memorable language of the Greek poet.*

Earnestly do we recommend those who are the victims of this sad propensity, seriously to reflect on the results which attach to it, and the injury done to their health and circumstances, by the fraudulent practices of which they are made the dupes, to satisfy the rapacious cupidity of the keepers of those vile dens of abomination—gin palaces.

NEW STONES.—IMPORTANCE ATTACHED TO THE SELECTION OF A STONE FOR BUILDING PURPOSES.

We have been favoured by Mr. Robert Adams, of the Old Barge House, with two specimens of stone: one from Otley Chevin in Yorkshire; and the other from Talacre, North Wales. The stone from Otley Chevin is certainly of a very superior description, and eminently adapted for the construction of public buildings, and for resisting the ravages of time. A piece of this stone was examined comparatively with a piece of Portland stone, and another of Scotch granite: they were subjected to the action of steam for six hours. When taken out it was found that they had absorbed as follows:—

Otley Chevin . . .	1½	per cent.
Scotch Granite . . .	3½	,,
Portland	5	,,

The Otley was the only one that remained in a fit state to be sawed: the Portland went to dust with the slightest touch; the Granite crumbled into small pieces.

The Talacre stone is the next that comes under our notice, and well worthy is it of attention. This stone is as superior for its fine appearance as for its extraordinary durability and compactness of structure. We examined this stone comparatively with that of Balsover Moor: the following is the mode in which we operated, and the results:—We took two pieces of each stone,—each weighing 1000 grains: we steeped them in water for 48 hours: after being removed from the water and being allowed to stand a few minutes that the water on the surface might drain off, these two pieces of stone were weighed: the Balsover was found to weigh 1053 grains, having absorbed 53 grains of water; the Talacre weighed 1031 grains, having absorbed but 31 grains. Thus the absorbent power of these two stones is nearly in the ratio of three to five. This difference is owing to the greater "porosity," as it is termed, of the Balsover Moor stone.

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* Pindar.

Porosity is one of the worst defects a stone can possess: it facilitates vegetation, by giving room for the roots to fix themselves, and by admitting so much water. But its porosity is attended with another and more direct evil: from the readiness with which it, structure admits water, in summer weather, heavy showers coming on will saturate it, and soon after, perhaps, the sun appears, shining with great power; the heat of the sun warms the water in the stone, and causes the latter to expand: the consequence of which is that the stone scales, as it is technically termed.

Mr. Jenkins, in a paper on this stone, read to the Institution of British Architects, gives the following description of the Talacre stone:—

"The mineralogical character of this stone is that of siliceous sandstone, with an argillo-siliceous cement. It is of great density, a cubic foot weighing 150¼ lbs.—is worked with great ease, and being remarkably free from hard untractable veins and soft places, is capable of a very smooth surface,—a fine arris and the most delicate carving. The closeness of its texture and fineness of its grain render it very desirable for external work in a large city, as it prevents the soot from adhering to it, and thus clogging up the mouldings and carvings, reducing them to an undistinguishable mass of blackness,—a fault justly complained of in the Bath and Portland stones."

It may not be irrelevant to mention that the shrine of St. Winifred's well, at Holywell in Flintshire, erected in the fifteenth century, is built of this stone; and we can bear witness to the high state of preservation in which this beautiful little building remains, although surrounded by humidity. The circumstance of its being erected over the well, from which humid vapors rise every night, is sufficient to have destroyed any other stone. We may also mention an ancient mansion in the village of Llanasa, constructed in 1642, and Rhyddlan and Denbigh Castles, built towards the end of the thirteenth century. Among recent edifices, Talacre Hall, the delightful seat of Sir Edward Mostyn, Bart. is a very beautiful specimen of a building erected with this stone. We recollect being much struck with its very elegant appearance.

Mr. Adams, who is bringing these stones into notice, deserves much praise for the good he is effecting: he has had upwards of thirty years' experience in the selection of stone.

It has been our object by the foregoing observations to show the necessity and importance of selecting a durable stone for building purposes, and we shall be happy, if by our instrumentality some little good may be effected. The state of some of our more recent public buildings is such as to demand greater care for the future in the selection of stone.

PATENT GRANTED TO MR. MOSES POOLE, FOR IMPROVEMENTS IN THE MANUFACTURE OF CAUSTIC SODA AND CARBONATE OF SODA.

ABSTRACT OF SPECIFICATION.

The patentee gives the following description of his process: we adopt nearly his own words:—

"The nature of the invention consists in the following system or cyclus of operations, by which these products are procured from common salt:—

"I first prepare sulphate of soda, by the double decomposition of chloride of sodium (common salt), and sulphate of ammonia, by which decomposition, sulphate of soda and hydrochlorate of ammonia are produced. The sulphate of soda is then converted into sulphuret of sodium, by heating it with charcoal, or any other carbonaceous substance, and this sulphuret of sodium is decomposed by protoxide of copper, by which decomposition caustic soda is formed, which, if required, may be evaporated to solid caustic soda; or it may be saturated with carbonic acid, and thus converted into carbonate of soda.

"The sulphuret of copper resulting from the decomposition of sulphuret of sodium and protoxide of copper, is then calcined in a current of atmospheric air, by which operation deutoxide of copper is formed; the sulphur being burned and volatilized in the state of sulphurous acid gas. I then combine this acid with caustic ammonia, gained by the decomposition of the muriate of ammonia, by means of lime, exposing the sulphate of ammonia thus obtained to the action of atmospheric air, and regain sulphate of ammonia, which is then again used for decomposing common salt.

"Lastly, the deutoxide of copper is converted into protoxide by moderate heating, with a certain quantity of coal. The same cyclus of operations may then be recommended; the ammonia as well as the protoxide of copper, and the greater part of the sulphur being recovered.

"I shall now give a more detailed description of this process or processes, which I divide in the following seven parts.

"FIRST PART.—As the conversion of common salt into the state of sulphate of soda, by its mutual decomposition with sulphate of ammonia, is a well known process, a description of it would be superfluous. The muriate of ammonia thus obtained is afterwards used for restoring sulphate of ammonia, as will hereafter be described.

SECOND PART.—The decomposition of sulphate of soda by heating it with coal, charcoal, turf-coal, coke, or any other sort of carbon, is also a well known process: but I recommend that this decomposition be effected in a closed vessel, in order to prevent the loss of a large quantity of sulphur which, otherwise, would be burned and thus volatilized.

THIRD PART.—The sulphuret of sodium, produced in the latter operation, is then dissolved in water and filtered, in order to separate the remaining coal (which may be employed in subsequent operations), and protoxide of copper in the state of a fine powder is added to the liquid, slowly and in little portions, and by well stirring the matter until the decomposition of the sulphuret of sodium is found to be completely effected, by adding to a small portion of it a few drops of a solution of sulphate of copper, which, if the decomposition is not finished, will produce a precipitate of a blackish colour; but if, on the contrary, the decomposition of the sulphuret of sodium is complete, it will give a precipitate of a pure blue colour. The sulphuret of copper is then separated from the liquid containing caustic soda, by filtering, or in any other convenient manner.

FOURTH PART.—If solid caustic soda be required, the solution of caustic soda may then be evaporated to dryness. If carbonate of soda be wanted, the solution of caustic soda is saturated with carbonic acid. Although any manner of putting caustic soda in contact with carbonic acid may be adopted, I prefer making use of a large vessel or chamber, constructed of bricks, and covered on the inside with Roman cement or any other convenient substance filled up with pieces of granite, limestone, or any other sort of stone, except such sorts of stone as might be considerably attacked by the caustic liquid. I suffer the liquid to flow gently over the stones, and at the same time I introduce a current of carbonic acid produced by the combustion of coal, coke, charcoal, or any other suitable combustible at the inferior end of the chamber. The carbonic acid, passing through the interstices of the stones will be absorbed by the caustic soda, and carbonate of soda will be formed, which may hereafter be evaporated and calcined in the usual way.

FIFTH PART.—The sulphuret of copper, gained as described in the third part of this specification, is now to be converted into deutoxide of copper by calcining it in such a manner as to allow the sulphurous acid gas produced by this calcination to be received in the apparatus destined for the preparation of sulphate of ammonia. I effect this calcination in an iron muffle, heated to a feeble redness, and I cause a slow current of atmospheric air to pass through the muffle, and then into the apparatus, which will be described in the next part of this specification. The sulphuret of copper which may form a bed of about one inch in the muffle, is to be well stirred until the smell of sulphurous acid ceases. The deutoxide of copper is then taken out of the muffle, and a fresh quantity of sulphuret is introduced in such a way that the muffle may be kept continually heated. It is now to be remarked that the deutoxide of copper brought into contact with the proto-sulphuret of sodium would decompose this latter so as to form a considerable quantity of hyposulphate of soda mixed with caustic soda. It is in order to prevent this hyposulphate of soda from being produced, that I employ the protoxide of copper which is obtained by mixing the deutoxide of copper with about $\frac{1}{23}$ of its weight of powdered charcoal or turf coal, and by heating this mixture in a well closed vessel of iron or any other suitable material to a feeble degree of redness.

SIXTH PART.—I have already observed that the sulphurous acid gas, produced by the calcination of sulphuret of copper, is to be received into any suitable apparatus, in order to be saturated with ammonia. I get this ammonia by distilling the muriate of ammonia procured, as described in the first part of this specification, with caustic lime. In order to combine this ammonia with the sulphurous acid, I use a large vessel or chamber, constructed of lead or any other suitable material, filled with fir chippings. By means of a ventilating apparatus, I cause a moderate current of atmospheric air to pass over the glowing sulphuret of copper in the muffle, as is above described; and after being sufficiently cooled by passing through a pipe surrounded by cold water, to move slowly through the interstices of the chipping. At the same time, the caustic ammonia is introduced on the upper end of the chamber, and gliding slowly over the chipping, it absorbs the sulphurous acid, and is thus converted into the state of sulphite of ammonia. In order to prevent any loss of ammonia that might be caused by the current of the air leaving the chamber, I employ a second chamber; or if it should be found convenient, several chambers of the same construction as the first, and also filled with chipping, through which the current of air is forced to pass, and over the chipping of which a very weak solution of sulphuric acid in water is caused to flow. By this means the ammonia, carried off by the air leaving the first chamber, is entirely absorbed, and thus saved, sulphate of ammonia bēing formed, which may be added to the solution of sulphate of ammonia, the preparation of which forms the last part of the process.

Seventh part.—This process consists in the oxidation of the sulphate of ammonia to sulphate, and is very easily performed by exposing a solution of the former salt to the contact of the atmospherical air. I employ for this purpose a frame or scaffold, constructed of timber, in any convenient manner, which I fill with fir chippings in such a way as to expose this chipping as much as possible to the access of atmospheric air. The solution of sulphate of ammonia is then made to flow gently over the chipping, and being received in a flat chest placed under the chipping, is pumped up again, until it is observed to be entirely converted into sulphate of ammonia, which is afterwards used for decomposing common salt, as is hereafter described. The manner of trying the sulphate of ammonia, or its being perfectly formed, consists in the addition of a few drops of sulphuric acid to a small portion of the liquid. If, on such addition, a smell of sulphurous acid be observed, the oxidation is not yet entirely finished.

I do not claim, as the invention, the mode of prepararing sulphate of soda by the decomposition of common salt, nor do I claim the conversion of sulphate of soda into sulphuret of sodium, nor the calcination of sulphuret of copper, nor do I claim any particular construction of apparatus which may be used for the process, nor do I claim certain proportions in which the substances used for the process may be applied, but I claim as the invention, consisting in certain improvments in the manufacture of caustic soda and carbonate of soda, the decomposition of sulphuret of sodium by the protoxide of copper, and, in combination with this prŏcess, the production of sulphite of ammonia, and also, in the conversion of sulphite of ammonia, to the sulphate, in the manner hereinbefore described.''

GANNAL'S PROCESS FOR EMBALMING.*

2·68 lbs. troy of dry sulphate of alumina are dissolved in ·88 (or rather more than ¾ of a pint of hot water). Five or six pints of a solution made after these proportions, are to be injected into all the vessels of the body to be embalmed.

To prevent the attack of insects, it is proper to add 15·43 grs. of chloride of copper to every 2·68 lbs. troy of sulphate of alumina, or 771½ grs. of arsenic.

METHOD OF FIXING PHOTOGRAPHIC IMAGES.†

BY M. H. FIZEAU.

Since the first publication of photogenic processes, every one, and M. Daguerre first, has acknowledged that some improvement was yet needed to give to their wonderful images all possible perfection; I mean, to fix the impressions and to give more intensity to the lights of the picture.

The process which I submit to the Academy appears to me capable of effecting both these objects; it consists in treating the impressions, with the aid of heat, by a salt of gold; prepared in the following manner:—

A gramme of chloride of gold is dissolved in a pint of pure water: three grammes of hyposulphate of soda are also dissolved in a similar quantity of pure water: the former solution is then gradually poured into the latter, stirring all the while: the mixed liquor, at first slightly yellow, soon becomes perfectly limpid. It appears to be a double hyposulphite of soda and gold, rather than a chloride of sodium, which seems not to act any part in the operation.

To treat an impression by this salt of gold, the surface of the plate must be quite free from foreign bodies, and especially from grease; consequently it must be washed with more than ordinary care. The following method of washing I have found most successful:—

The impression being quite iodized, but free from dust and grease on the two surfaces and the edges, a few drops of alcohol were poured on the iodized surface; when the whole surface was well wetted with alcohol, the plate was steeped in water and afterwards in a solution of hyposulphite of soda. This solution should be renewed with each impression, and should contain one part of the salt to fifteen of water: the remainder of the washing may be effected in the ordinary way; the washing water should, as far as possible, be free from dust.

The employment of alcohol is simply with the view of making the water adhere to the whole surface of the plate, and of preventing it from running off the edges at the different immersions, which infallibly produces stains.

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* *Inventor's Advocate.*

† *Academie des Sciences;* Sitting of the 10th of August, 1840. *Comptes Rendus,* No. 6.

When a plate has been thus cautiously washed, the treatment by the salt of gold is very simple: it suffices to place the plate in an iron wire frame, to pour upon it sufficient of the salt of gold to cover it, and to heat it with a powerful lamp: the impression becomes clear, and acquires, in a minute or two, great vigor. When the effect is produced, the liquid must be poured off and the plate washed and dried.

In this operation, silver is dissolved, and gold is precipitated on the silver and on the mercury, but with very different results; indeed, the silver which forms the shades of the picture, is in some measure turned brown by the thin layer of gold which covers it, whence the shades are rendered more powerful; the mercury, on the contrary, which, in the state of infinitely small globules, forms the lights, is increased in its solidity and lustre by its amalgamation with gold; whence results a great fixity and a remarkable increase in the lights of the image.

The memoir concluded by considerations concerning the chemical actions which take place during the different stages of the operation.

IMPROVED MODE OF MANUFACTURING GAS, AND PREVENTING SMOKE FROM COAL FIRES.*

Various methods of producing inflammable gases, by the decomposition of water by means of ignited carbon, in which both the elements of water (oxygen and hydrogen) combine with the carbon, have been lately brought before the public. The simplest, and most effectual plan is by passing steam through the retort charged with coal. In this way, any coal, even anthracite, which contains no gas whatever, may be made to produce gas of the finest quality. This plan has lately been adopted with great success in the Paris gas works, and has been tried with equal success in this country, upon a small scale. Using bituminous coal in this way, the entire combustible matter of the coal is converted into gas, consequently, neither tar nor coke is obtained, but an infinitely greater proportion of gas, and that possessing extraordinary powers of illumination. The plan possesses also these advantages, which are of some importance in crowded situations, with an increasing demand for gas-lights,—that the gas may be generated much more rapidly, and requires no purification. This plan will also prove of great value in districts possessing coal containing little or no gas.

It being thus proved that the vapour of water passing through ignited coal converts the whole combustible portion of the coal into inflammable gases, it follows that a well-regulated supply of vapor to a bituminous coal fire would prove an effectual preventive to smoke—smoke being merely the tar and light particles of coal, or lamp black, escaping unburnt from the fire, which would by this application be converted into the gases, carbonic oxide and carburetted hydrogen. A simple and effectual method of applying the vapor, under careful regulation, offers itself by the adoption of a newly-invented fire-grate, consisting of a hollow frame, to be kept filled with water, upon which the grate bars rest, so contrived that a portion of vapor may be kept continually passing through the fire. The same contrivance preserves the bars from burning, and the coals from clinkering. This invention is, we are given to understand, about to be submitted to the public, and, should it turn out successful in practice, upon a large scale, will prove a great benefit to the metropolis, as, should it be adopted in the large breweries and distilleries, the atmosphere will be relieved of much of the densest of the smoke with which it has been hitherto so much impregnated.

ON THE KILLING OF MERCURY.

To the Editors of the Chemist.

October 15th.

Gentlemen,—Among the many chemical manipulations in existence, I know of no one less understood, and yet requiring a perfect knowledge of every chemist, than the *killing* of mercury, as it is called.

The vast quantity required in the agricultural districts for smearing sheep, &c. would scarcely be credited by any London chemist, and the uncertainty attending the trituration usually employed, is such, that a few hours' labor, with the same ingredients and atmosphere combined, will produce the same result that at other times as many days are required for.

I wish you, or some of your correspondents who may have paid attention to the subject, would give their opinions as to the best mode of killing—say six pounds at a time.

The explanation in Phillips's Translation of the Pharmacopœia is very unsatisfactory, as he reprobates the use of Ol. Sulphuretum and Terebinth. without offering substitutes, and with the following remark closes his information by saying that "he has been assured that the admixture of a portion of old ointment greatly facilitates the operation,"—what quantity, or why it so acts, he does not attempt to explain.

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* *Mining Journal.*

One method, and as good as any other that I am acquainted with, is

Hydrargyri, lb. vj.
Serum ovillum, ℥viij.
Oleum sulphuretum, ℥iv.

Rub until the globules disappear, which is ascertained by smearing a very small quantity on a piece of brown paper; if no globules then appear, it is considered fit to mix with the lard.

I have made many tons weight in this manner, and have not heard any complaint of its want of effect. The uncertainty of the time required for the trituration and the obtaining a result by mere chance, is attended with so little satisfaction, that I trust, through your ably conducted periodical, to be made acquainted with the cause of the effect, and the effect of the cause.

Yours respectfully,
A Subscriber.

ON THE GALVANO-PLASTIC ART.

A correspondent, M. Z——, of the *Journal des Connaissances Necessaires et Indispensables*, gives the following process in a letter to M. Chevallier, the editor of that journal:—

"It is well known, says M. Z——, that Professor Jacoby of St. Petersburg has lately published an interesting discovery, which consists in taking metallic impressions, by means of a very powerful electro-galvanic apparatus. In Germany, this method is called *galvano-plastic*."

"Allow me," continues he, "to acquaint you with a simple and easy process by which, without any costly galvanic apparatus, the most beautiful impressions may be obtained.

A strong solution of sulphate of copper is prepared; it is filtered, and in the solution is put a piece of zinc of convenient size and form, and on this piece of metal is put the object whose impression it is desired to obtain, or the piece of zinc may be put by the side of the object, on a sheet of copper. The whole is submerged in a solution of sulphate of copper contained in a hollow plate: it is immediately remarked that a crust of copper is formed on the object of which we wish to obtain the mould. It is left to stand for some days, taking care to remove the zinc, and the object to be moulded from the solution, every five or six hours, in order to wash off any black oxide that may have been formed, and a fresh solution of sulphate of copper is used; the cupreous crust will in a short time be formed, and sufficiently strong to be able to be very easily detached: it will be seen that it bears the finest and most delicate impression of the object. By thus operating on images produced by the daguerreotype, an engraving or an engraved plate may be obtained from which impressions may be produced on paper, after the manner of copper-plate engravers. If it be wished that an impression of only one side of the object should be made, then the latter is placed on the sheet of copper, and a border of wax is made round it, so that the solution cannot be introduced between the two, and the operation is carried on as above. When the crust is formed, the wax is melted, and the impression may very easily be detached.

III. PHARMACY, &c.

SARSAPARILLA AND ITS PREPARATIONS.*

BY MR. JOHN MACKAY, OF EDINBURGH.

Sarsaparilla is a medicine which, for nearly three centuries, has at one time been raised to the first rank in our remedial agents, and at another sunk almost to obscurity. Perhaps upon no subject are the medical profession more divided at present, than the merits of this substance, and to no preparation does the pharmaceutist generally do less justice than to the Decoct. Sarsæ. Co., and the other forms of prescribing sarsaparilla. This is the more to be regretted, since this medicine, like most others, varies in its effects, according to the care bestowed upon its preparation; and I am inclined to believe that much of the disgrace to which sarsaparilla has been consigned might be traced to the imperfect production of some of its compounds. In addition to this, the prejudices of some medical gentlemen, conjoined with the disinclination of the patient to pay so much for this medicine, militate against its general and frequent use. It is, however, foreign to my purpose to enquire into the claims which the sarsaparilla has to a more extended use, or to the question, whether the beneficial effects produced by the compound preparations arise from the root itself, or from the other woods entering into combination. My object is, to draw the attention of the chemist to the fact, that insufficient care is taken with the preparations. But though the charge which I am about to make applies to many druggists, yet I would wish it to be understood that there are not a few honourable exceptions.

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* Communicated by the Author.

The forms under which Sarsaparilla are recommended are:—Decoction, Extract or Essence, Lozenge, and Syrup.

Of all preparations of sarsaparilla, the Compound Decoction appears to be the one upon which most dependence can be placed. Great carelessness is practised in making this fluid. From the dark colour and sweet taste of the decoction, the patient has no criterion by which to judge of its excellence,—unless it is sent of so pale a color as to attract his attention. I have seen decoction sent out, bearing the same reference to proper medicine that small beer does to porter. We shall be more convinced of this by comparing the general with the proper mode of producing the decoction. The former consists in throwing a deficient quantity of the root amongst water, placing upon the fire, boiling for half an hour, adding the mezereon, &c.; continue the boiling a little longer, remove, strain, and we have the decoction. I have known the process completed, and the fluid sent away to the patient within an hour. It is no uncommon thing to make the *fresh* decoction by mixing the fluid extract with water. The latter is well followed, by attending to the formula given by the College. I have invariably found, however, that the decoction is rendered more powerful by keeping the liquid during five hours a *little below* the boiling point, allowing it to simmer, and stirring it frequently. Nothing is better for this purpose than a hot plate, heated so as to prevent the liquid being raised so high as 212°. I never *bruise the root*, and for this reason, that as the whole virtue of sarsaparilla is known to reside in the cortical part, which lengthened maceration even in cold water will reach,—so no step is gained, but that of rendering the preparation thick and sandy, by crushing it. Thus, without increasing the power of the preparation, it may be rendered more nauseating to the patient.—When the guaiac. sasafras. mezereon, and liquorice are added to the hot simple decoction, the liquid ought to be kept at the boiling point no longer than fifteen minutes,—and during this time the cover should be kept as closely as possible upon the vessel. So much is dependent upon the decoction being carefully made, that one of our most celebrated surgeons in this town, (from the very bad preparations sent out repeatedly by some druggists,) is in the habit, when recommending this medicine, to order only the herbs, advising his patients to make their fireside the laboratory. Attention is required to the mode of preparation of the decoct. sarsæ. co., and is loudly called for. The simple and compound extracts have of late fallen much into disuse. We cannot be surprised at this. The term "*in vacuo*," as applied at the present time to the preparing of extracts is often erroneous, and more for the sake of euphony, as there are some, who, boiling the liquid in an open vessel for twelve successive hours or more, give the above term to their production. Even more liberty is taken by some in forming their fluid extract or essence; for the great aim of many is to produce a very dark-looking, thick fluid; to accomplish which, they hesitate not to add *gum acac.* to do the one, and *sacc. elycynh.* to accomplish the other. To this the high-sounding title of "*Fluid ext. sarsæ. prepared in vacuo to the entire preservation of its excellent qualities, forming in* ONE MINUTE *the decoction as ordered by the Pharmacopœia*," &c., is given and recommended, from its portability and superior qualities to the real decoction prepared from the fresh ingredients. I know this to have been done, and have examined such a preparation. I am inclined to believe that few of the "*concentrated essences*,"—made for convenience, and possessing such transcendant powers, possess much activity. Many of them are not prepared *in vacuo*, and as we know that the morphia in opium,—the cathartine in senna, and some other principles are destroyed by continued boiling,—may not the sarsine be also partially dissipated by long boiling. Like many others, I detest quackery much, and yet I fancy, that this or something closely approaching it, is carried on to a great extent, in this particular medicine.

About four years ago the sarsaparilla lozenges created some stir, but are now almost exploded. Upon their first introduction they were recommended as an alterative,—a remedy in all cutaneous diseases,—and for weakened digestion. I suspect that they were more to please the taste,—and received notice from being new, than from any power which they had. I subjoin a formula, according to which I believe some were made, which will serve to show the small, trifling quantity of the extract contained in each lozenge.

TROCH. SARSÆ.

R. Extract sarsæ. simp. . ℥viij.
Elycynh. pin. . ℥iij.
Solve in aqua bullient. ℥xvj. fiant solutio et misceantur ā pulv. sacch. alb. 26 lb. Gum acaciæ 2 lb. vel q. s. ft.

Divide in troch.

The above should produce 28 lb. lozenges, when dried, cut of an oval form, resembling somewhat the troch. papaver. in appearance.

Of course they may have been made of various strengths, but some were made according to the above proportions. Now, upon calculation, we shall find that each lozenge would contain about the fourth of a grain,—not a very large quantity, certainly. They are, however, little known now, and rarely used. The syrup is the only remaining preparation,—it, however merits little notice, as it appears to be more a *placebo* than an active agent. Containing so large a quantity of saccharine matter, is against its general employment, preventing a sufficiently large dose to be repeated without injurious effects to the stomach. It may, however, form a very useful adjunct to some more powerful preparation. The colleges give formulæ for its formation, but unless in some very peculiar states of the constitution,—to sweeten the decoction,—or for children,—I do not suppose that it is frequently employed in medicine. Sarsaparilla has also been used in the form of powder, and I understand with beneficial results. But there are many objections to the employment of sarsaparilla in this state. The large quantity of woody fibre in each dose, and the liability of the powder to spoil when kept, are much against it.

In the use of sarsaparilla as a medicine, there is no better way of testing its powers than by preparing the decoction carefully and at intervals of two days,—when kept longer than this, even in a cool place, it is very apt to spoil, from the large quantity of vegetable matter which it holds suspended. But a thing of primary importance is that of obtaining a good sarsaparilla. Much useless root is sold, for by long keeping the active principle lying between the woody part and the bark, becomes quite mouldy, and thus the medicine is nearly inert. This will be visible to any one by breaking a portion of it across, and exposing this part. Always obtain a fresh sarsa, and have it invariably cut with the radicles on. The interior of the cortical part should have a dark red colour, and the root of a moderate size. The Jamaica is the best, and far superior to the Lima, which is the one generally sold. A little time ago none of the former was to be had in the London market, and a great deal of the latter kind was vended at a lower price. If more attention were paid to the selection of the root, and to the mode of preparation, few medicines would, I think, be more celebrated than the compound decoction, when made fresh once in two days, and ℥xij. drank during each day for a period of three or four weeks.

Edinburgh, E. S.

ON POISONING BY AMMONIA.—REMEDIAL MEASURES.*

BY DR. ALPHONSE SOUCHARD.

On the 10th of June last, at a quarter before twelve at night, we were called on to attend M. Antomarco Piétri, pupil of M. P., pharmaceutical chemist at Batignolles. This unfortunate young man, whom the neighbours and ourselves had seen in full health a few minutes previously, was in the greatest danger: we were informed that he had just been found in an atmosphere of ammoniacal vapour, for a length of time which we could not exactly calculate, but which we thought to be about three quarters of an hour. This accident was caused by the breaking of an enormous stone bottle, containing no less than fifty quarts of volatile alkali. It had been sent in the very same evening by the merchant, and M. Piétri being too busy to be able to take it down into the cellar, it was imprudently decided that it should remain for the night in a corner of the shop. Nothing happened until M. P. went to bed; but by an unfortunate fatality, a very short time had elapsed since he had retired into a small bed-room joining the shop, the door of which he was in the habit of leaving open, when he was awakened by a sensation of violent constriction of the throat, and a great difficulty of respiration. It was the bottle of ammonia, which, no doubt, too high a temperature had broken. M. Piétri, disturbed in so unexpected a manner in his first sleep, not knowing at first what to attribute it to, immediately ran into the shop to gargle his throat with water; but he had no sooner entered it, than he felt completely suffocated, and would certainly have died on the spot, if a good woman, who slept at a little distance, and whose attention was attracted by the cries of the unfortunate young man, had not promptly run to his assistance, and arrived, at all hazards, to save him from such danger.

We found the patient, on our arrival, in the following state:—

He was still in the corridor leading to the shop, supported by several persons: our first care was to carry him into the open air in a neighbouring yard, quite free from ammoniacal vapour. His posture and gestures indicated great anxiety: the face, the features of which were violently discomposed, had red patches on it, so much the more vivid as they approached the natural apertures: the mucous membrane of the nostrils and lips was destroyed: from the nose and mouth flowed a bloody foam, which already soiled his shirt: the tongue, which was of a bright red, seemed to be deprived of its epithelium; on some parts it was covered with a thick white mucus, which might have been taken for portions of false membranes: the whole buccal cavity presented nearly the same character: the patient, from whom we could obtain only sounds of a weak and inarticulate voice, at first complained of a sharp pain in the throat, but which soon extended to all the chest: respiration was extremely difficult, and there was a continual danger of suffocation; by auscultation we heard only a tumultuous rattle; thirst was excessive, but deglutition was almost impossible; the efforts which the patient made to swallow the drink presented to him brought on a very painful cough, which caused, at very distant intervals, an expectoration of mucous matters; the skin was hot, but not very dry: the pulse weak, irregular, and frequent; no convulsive motions; the eyes were red and sparkling; the forehead, all the vessels of which were charged with blood, was hot to the touch. We did not hesitate to bleed copiously, and we had the satisfaction of seeing, after blood had been taken away, that the blood which accompanied the expectoration disappeared, which contributed not a little to re-assure the patient. Immediately after, M. Piétri having been removed into a bed which had been prepared for him in a suitable place, we had recourse to vinegar water. Its injection, although troublesome and very painful, was not long in showing good effects; for two hours had scarcely passed in the midst of indescribable anguish, when auscultation furnished us with more satisfactory signs: thus, instead of the rumbling noise which it would be difficult for us to characterise, which we remarked at first, we could recognise some points of the left side, where respiration, although still difficult and stertorous, might be perceived, whilst on the right side it retained all its known characteristics: besides, the patient seemed to suffer less: his attention was devoted only to his throat, and, indeed, deglutition very soon became impossible. By the application of a good number of leeches, *loco dolente*, we were again able to combat this symptom; revulsives, frictions, astringent gargles, purgative injections, and bathing, completed the treatment we thought fit to adopt in this case. At the expiration of forty-eight hours, we could declare that M. Piétri was saved. Still for some days he showed all the symptoms of acute bronchitis, with abundant expectoration: he was subject to complete aphony for five or six days; but this ceased, and he is now perfectly recovered.

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* *Journal de Chimie Médicale*, Sept. 1840.

The fact noticed by Dr. Souchard is extremely curious; he acquaints us with the remedial measures to be taken in cases of poisoning by ammonia.

We have delayed the publication of this interesting case, waiting for the decision on the following case of poisoning by ammonia. The court of assize for the department of the Seine, has been occupied with an accusation against Louis Frederic H——, aged six years, who had poisoned his little sister, on the day of her baptism, by putting into her mouth several spoonfuls of ammonia, and who, being out of patience at her not dying, introduced a long hair pin into the ear of his victim: but this affair was not concluded, H—— having died in prison, of disease of the lungs.

Ammonia has already been known as a poison, and Perey, *Bulletin de la Faculté*, has published the case of the son of an apothecary who fell a victim to the bursting of a bottle of ammonia. Syster says that he has seen an epileptic patient, who had been unskilfully recovered, die two days after of croup, and it was discovered, on the *post mortem* examination, that a false membrane had been formed. Fourcroy, in the *Encyclopedie Methodique*, makes known the serious symptoms resulting from the inconsiderate use of ammonia in a case of syncope.

ON A NEW MODE OF USING MARSH'S APPARATUS IN MEDICO-LEGAL INVESTIGATIONS.*

BY M. LASSAIGNE.

It is well known that this apparatus is capable of detecting the presence of $\frac{1}{2000000}$ of arsenious acid in solution in water, by taking certain precautions indispensable to the condensation of the arsenical vapor on the porcelain saucer or capsule. These precautions, for such minute quantities, are:—

1st. To take care that the flame of the gas in combustion be neither too powerful nor too weak.

2nd. To hold the porcelain capsule in a slightly inclined position, which arrests the jet of the flame.

3rd. To ascertain the precise moment when the arsenious acid, diluted in a great quantity of water, is decomposed, and passes to the state of arseniuretted hydrogen; now, this moment is not indicated by any particular sign; it is only by testing, from time to time, the flame on the capsule, that it is rendered evident by the appearance of a slight variegated greyish yellow stain, which is the precursor of the disengagement of arsenic.

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* *L'Institut;* No. 355, Oct. 15, 1840.

The difficulty which these circumstances present, has led M. Lassaigne to invent a means which, truly speaking, is only an application of the known properties of arseniuretted hydrogen, and serves to characterise it. It consists as follows:—

The gas disengaged from Marsh's apparatus, is driven into a solution of pure nitrate of silver; the arseniuretted hydrogen, which is found mixed with the hydrogen gas, is gradually decomposed by the oxide of silver; the latter is then reduced, the liquor turns brown, metallic silver is deposited at first in black flocks, and arsenious acid is produced and remains in solution mixed with the excess of nitrate of silver employed All the arseniuretted hydrogen having been absorbed and decomposed, hydro-chloric acid is gradually added to the solution, in order to decompose the excess of nitrate of silver and to convert it into the chloride; it is then filtered to separate this chloride, which is then found mixed with the metallic silver precipitated at the time of the passage of the arseniuretted hydrogen, and it is evaporated at a gentle heat, in a porcelain capsule. During the concentration and evaporation, the nitric acid contained in the liquor acts on the arsenious acid, converting it into arsenic acid. This latter forms the residue of the evaporation, and it is then easy to clearly ascertain the chemical properties.

The author asserts that he has applied this process to detecting one milligramme of arsenious acid dissolved in 1000 grammes of distilled water. He remarks that the absorption of the gas by the nitrate of silver, allows of *all* the arsenic which is disengaged in the gaseous state from Marsh's apparatus, being gathered, whilst, by the common method, which consists in burning the hydrogen under the form of a jet, which is deposited on the capsule, indubitably a great part must be lost.

ON CERTAIN CAUSES OF ERROR WHICH MARSH'S APPARATUS MAY OCCASION IN MEDICO-LEGAL INVESTIGATIONS.*

BY M. LOUYET.

If we heat a piece of a phial by means of the blowpipe, the heated part soon becomes red, for the sides of phials are very thin: afterwards, if it be left to cool, a circular stain will be observed, more or less deep and brilliant, and in every respect analogous to those which the flame of Marsh's apparatus produces on glass or porcelain, containing arsenical matter decomposable by hydrogen or sulphuric acid. If for a piece of phial glass a piece of any other glass, such as glass tube, a watch-glass, &c., be substituted, this phenomenon does not occur: it is also well to remark that these stains are formed at the heat of reduction, and disappear in the heat of oxidation. If for the blowpipe and the lamp or taper, a Marsh's apparatus containing distilled water, pure zinc, and sulphuric acid, be substituted, and if the flame of the hydrogen produced be directed on a similar piece of phial, the brilliant stains again appear; as in the preceding experiment: these stains are formed at the heat of reduction, and disappear at that of oxidation. By alternately applying the heat of reduction and the heat of oxidation, the brilliant stain formed on the glass may be made to appear and disappear repeatedly. The flame of hydrogen, applied to pieces of other kinds of glass, produces the same negative effect as that of the taper and blowpipe.

At first I thought that the glass of the phials contained arsenious acid—a substance of very frequent use in glass-houses—and that this substance was decomposed either by the action of heat and of the matters contained in the glass, or by the carburetted hydrogen which the inner flame of the Marsh's apparatus might contain, and which the flame of a taper or of a lamp always contains; but I was compelled, by the following experiments, to renounce this hypothesis:—

Ten parts of broken phial glass were powdered and put into a platinum crucible with thirty parts of potassa; the whole was exposed to a red heat, in a reverberatory furnace. The crucible having been withdrawn from the fire, the matter, when cold, was dissolved in a certain quantity of distilled water. The silica was precipitated by pure sulphuric acid, separated from the liquid by filtration, and washed several times with distilled water; the washing waters were added to the filtered liquor, and the whole was exposed to a gentle heat until reduced to one-third. It was then immediately put into a Marsh's apparatus, holding a quart, and containing distilled water and *pure* sulphuric acid and zinc. The hydrogen gas which was disengaged was lighted, but its flame deposited nothing on a porcelain plate. Two drops of a solution of binarseniate of potassa were introduced into the apparatus, and I immediately obtained many brilliant variegated stains of metallic arsenic. The glass then did not contain arsenious acid, for that body would have combined with the potassa, and its presence would have been detected by the flame of the hydrogen gas.

Although unable to give any pausible

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* *Royal Academy of Sciences*, Brussels; Sitting of June 6th, 1840.

explanation of the formation of these stains, I have noted this fact, because it may occur in using Marsh's apparatus for detecting arsenical matters, that pieces of medicine bottles may be used for condensing the arsenic which is afterwards believed, on account of the stains, to have been found where in fact it did not exist. I am well aware that we cannot depend on the single character of the formation of brilliant stains, to prove with accuracy the presence of arsenic in the matter examined, and that besides, it is necessary that these stains should be soluble in nitric acid, thus forming a liquid which precipitates nitrate of silver of a yellow colour, &c. &c.; but inexperienced persons might be deceived by them. I may add also, that having boiled a quantity of fragments of these phials in nitric acid, for about two hours, the concentrated liquid gave not the least precipitate with nitrate of silver.

MARSH'S APPARATUS FOR DETECTING ARSENIC.*

An article in the *National*, on the means of detecting arsenic by Marsh's apparatus, contains some details that are not without interest as connected with the proceedings in Madame Laffarge's case. It appears that this apparatus is of the most astonishing sensitiveness for the detecting of arsenic in the minutest quantities submitted to its action; so much so, that Mr. Marsh himself, by a modification of his process, has detected the presence of this poison when operating upon only one drop of arsenical solution, containing the one hundred and twentieth part of a grain of arsenic. The principle upon which the apparatus is framed, is this—that hydrogen gas has to be formed in the midst of the matter suspected to contain arsenic; that this gas is to be burnt on coming out of the apparatus; and then that the products of this combustion should be examined. One of the principal properties of arsenic is to form a gaseous combination with hydrogen, of an excessively deleterious nature, called arsenicited hydrogen; it burns in this form just like common gas, and leaves as a residue a brown solid matter, or a sort of metallic soot, which is, in fact, the hydrurate of arsenic. If, after the gas is set on fire, a piece of glass is presented to the flame, the combustion is thereby retarded, and there is deposited on the glass a circular bone of metallic arsenic. In Marsh's apparatus a small glass tube is used, and the inflamed gas being admitted into it, there is deposited, if the gas contains any arsenic at all, first, metallic arsenic at the part of the tube in contact with the flame; secondly, white arsenic or arsenical acid a little higher up the tube; thirdly, a strong smell of garlic, the arsenic smell, at the other end of the tube. It is an apparatus of this kind that has been used in the experiments by the chemists at Tulle. Since, however, this method detects arsenic in such exceedingly small quantities, it becomes liable to objections when used in cases of forensic medicine. Thus the zinc employed to make the hydrogen gas may itself contain arsenic, as it nearly always does in small quantities; the sulphuric acid employed for the same purpose may contain arsenic, as the English acid nearly always does; and, in short, the most extreme care is requisite in discriminating as to what source the arsenic comes from, when its presence is detected by the apparatus. When, however, Marsh's method fails in detecting any arsenic at all, it may be taken as a most positive test that there is no arsenic whatever in the substances examined.

ON THE TESTS FOR SULPHURIC ACID WHEN THROWN ON THE PERSON.†

BY R. D. THOMSON, M.D.

The author's object was to take into consideration the accuracy of the various modes of testing sulphuric acid when employed for criminal purposes, and particularly when thrown on the person. A case had lately occurred to him in practice, which was brought before the last session of the Central Criminal Court, which proved that the mode of determining the presence of *free* acid by *mere* testing was by no means satisfactory. In a fit of rage a woman threw a quantity of oil of vitriol in the face of a cab-master in the vicinity of Euston Square, and before the unfortunate sufferer could wash off the acid two minutes had elapsed, and loss of sight was the consequence.

Dr. T. stated that having attentively considered this case, and having made a series of experiments on the eyes of dead animals, he had discovered that this sort of blindness was perfectly curable, and he had accordingly proposed an operation for this purpose in a paper read at the Medical Section. But besides having his face injured, the man's hat was discolored also by the acid. This was sent to the author, to determine the nature of the agent in this work of destruction. The result of his experiments was, that the injured hat, as well as an uninjured one, contained sulphuric acid, as tested by nitrate of baryta, and a solution of the soluble matter of both states of this article of dress afforded an acid reaction.

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* *Galignani's Messenger*; and *Inventor's Advocate.*

† British Association: Meeting at Glasgow, Sept. 1840.

It was therefore necessary to adopt some method which would afford a discriminatory test between the free and combined acid; the usual mode of boiling with caabonate of lead, and concluding, if any insoluble sulphate of lead was formed, that the acid existed in a free state, was found to be totally fallacious, because carbonate of lead decomposes sulphate of soda, contrary to the opinion stated in works of medical jurisprudence. Moreover, it was shown that many of the usually so called neutral sulphates exhibit, in reality, an acid reaction on test paper, as in the instances generally of sulphates of potash, iron, soda, barytes, and also in the cases of alum, &c.; hence the excess of acid attached to these salts would be apt to act as free acid upon the barytes test.

Dr. Thomson therefore concludes that the only demonstrative proof which chemistry affords is a quantitative analysis. He found the entire hat to contain ·356 per cent. of sulphuric acid, probably in the state of alum or copperas, and the injured hat 1·379 per cent.; or, in other words, the hat had received by the injury 1·023 per cent. of free sulphuric acid. Here was afforded clear evidence of the nature of the agent employed to effect the injurious object, which could not have been conclusive if the matter examined had only amounted to a drop or a stain. The author directed attention to a point connected with sulphuric acid in a medico-legal point of view, viz. that the oil of vitriol of commerce always contains, in this country, nitric acid, in addition to various other impurities.

M. Barruel has stated that sulphuric acid is capable of dissolving platinum. The author has not been able to satisfy himself that it dissolves any sensible quantity of gold leaf. M. Barruel attributes the property, which he states it to possess, of dissolving platinum, to the sulphuric acid assuming the function of muriatic acid. But the author is not aware of any experiment which authorizes this conclusion. He is rather inclined to attribute the action, if such an occurrence takes place, to the muriatic acid which is present in all the oil of vitriol prepared from sulphur that he has examined. It is given out in sensible quantities when a solid oil, such as cocoa-nut oil, is acted on by sulphuric acid. This he ascertained several years ago, when examining some Indian oils, and Dr. Kane has since corroborated the fact of the existence of muriatic acid in oil of vitriol, although the author has not been able to observe the solution of any sensible quantity of gold leaf by the action of oil of vitriol *per se;* yet if a few drops of muriatic acid be added, the action becomes very powerful, and by the application of heat platinum also is dissolved.

These facts, therefore, prove that whenever we have oil of vitriol we may expect also nitric acid. The author added, that he knew of no certain mode of detecting the presence of nitric acid save by the property which it possessed of dissolving gold and platinum by the addition of muriatic acid.

Pure morphia has no action upon nitric acid. It is the resin which generally accompanies that alkaloid which produces the characteristic yellow colour. But the author found that preparations of opium in which the resin was excluded, afforded no colour when nitric acid was added.

From an examination of numerous cases of poisoning by opium which had appeared before the Middlesex coroners, he had come to the conclusion that the resin-of-opium test for nitric acid, afforded only an auxiliary method of arriving at the truth, as its characters were frequently usurped by other organic substances.

MODE OF DETECTING MINUTE PORTIONS OF ARSENIC.

BY DR. CLARK, OF ABERDEEN.

This mode had been applied by the author to the detection of arsenic in commercial specimens of the metals tin and zinc. Grain tin, made in Cornwall, contains arsenic, which seems to be the occasion of the peculiar smell of the hydrogen evolved from that metal by the action of acids. All the specimens of commercial zinc that the author had happened to try were found to contain arsenic. Pure muriatic acid, diluted with distilled acid, is poured upon the metal, and the hydrogen evolved is passed first through a solution of nitrate of lead, and next through a solution of nitrate of silver. Nitrate of lead seems not acted upon by arseniuretted hydrogen,—at least, when in very small proportion; but were any sulphur present in the metal, sulphuretted hydrogen would be evolved in consequence, and the solution of nitrate of lead would be blackened, which, however, the author did not observe ever to occur. But nitrate of silver seems immediately to be acted upon by most minute portions of arseniuretted hydrogen. A bluish black precipitate is formed, which, to judge from a qualitative analysis, appears to be an arseniuret of silver. This bluish black precipitate may be collected with remarkable facility, from its falling readily from the solution, which it leaves perfectly clear. Heated in a small tube, so that the matter heated comes into contact with the air, the bluish black precipitate evolves arsenious acid, which, by the liquid tests, may be further satisfactorily recognized. Antimony produces a similar precipitate, so that the mere appearance of the precipitate is not enough, without the production and recognition, by the usual methods, of the arsenious acid. By a few evident modifications, this method may be applied to medico-legal investigations.

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* *British Association for the Advancement of Science;* Meeting held at Glasgow, September 1840.

Dr. R. D. Thomson had found that the electrical method of Mr. E. Davy was inapplicable, in consequence of the deposition of a black matter from the zinc, which he had considered to be bitumen. Dr. Clark has, however, proved it to be arsenic.

MADAME LAFFARGE'S CASE.

To the Editors of The Chemist.

Oct. 3d, 1840.

GENTLEMEN,

In No. X. of The Chemist for Oct. I perceive the statement made by M. Orfila to the Court, on the trial of Madame Laffarge, respecting the detection of arsenic in the body of M. Laffarge. I am quite aware of the just celebrity of that great and distinguished chemist, yet I venture to address you a few lines on the possibility of his being mistaken.

It is indeed but a mere possibility, but as I am certain there is no man who would sooner confess an error, and endeavour to repair it than the gifted Orfila, could he be assured he had committed one, I submit the following to consideration.

He informed the Court that the tests were pure; but if I am correct in my recollection of the report, he merely mentioned that the nitric acid and the nitrate of potassa were pure, but he did not say the sulphuric acid or the zinc used in Marsh's apparatus had been tested for arsenic, and he admits the apparatus in question to be of recent date, and not generally understood. When it was first made public it was considered as certain in its results even in the hands of the most inexperienced; but subsequent trial has proved that it is liable to fallacy by the *production of arsenic* from the materials themselves used in the preparation of the hydrogen gas, should they accidentally be contaminated with that metal. Sulphuric acid often contains arsenic in solution, and the zinc of commerce is almost always impregnated with it. Thus, if M. Orfila did not purify these agents, or if they were not originally pure, the arsenic produced may have arisen from them, instead of from the body of Laffarge.

Turner, in his Elements of Chemistry, under the head Arsenic, is most explicit on this subject, and I refer you to his work for further particulars.

I am sure you will do me the justice to believe, it is not my intention for a moment to call in question the skill of such a celebrated man as Orfila, but rather that what I have written has been with the distant hope of saving an unhappy and miserable woman from a dreadful punishment, should it turn out that the agents *used* in Marsh's apparatus were impure.

I am, Gentlemen,
Your most obedient
Humble Servant,
A SUBSCRIBER.

ON THE PREPARATION AND EMPLOYMENT OF SESQUI-IODIDE OF IRON.*

BY DR. OBERDÆRFFER.

Iodide of iron is so easily decomposed that the apothecary is often obliged to renew it, although it is but seldom asked for. The author has ascertained that this iodide, prepared and kept with the greatest care, gives rise, in a certain time, to precipitates, if used in solution. He therefore conceived the plan of replacing it by a sesqui-iodide of iron, which he prepares in the following manner:

Half an ounce of iodine is mixed with a drachm and a half of iron filings, and an ounce of water, in a glass vessel. When the action commences, it is gently stirred until it acquires a green color, owing to the formation of iodide of iron. It is then diluted with four ounces of water, and filtered two or three times. Two drachms of iodine are then added, and are readily and completely dissolved. From this results a deep brown liquor, to which is added sufficient water to make the whole amount to ten ounces. Each drachm contains about four grains and a half of iodine, and may be kept for a long time without decomposition taking place.

This medicine has long been used at the General Hospital of Hamburgh; it produces the same effects as iodide of iron; only it must be given internally, in smaller doses.

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* *Zeitschrift für die gesammte Medicin.* No. 14. 1840.

The form of syrup is preferable.

ON SYRUP OF VIOLETS.

BY M. POITEVIN.

M. Poitevin, contrary to the opinion given by M. Gueranger, insists on the necessity of washing the violet flowers; he has seen, even when this washing has been operated with distilled water, that it extracted a small quantity of green colouring matter. He recommends not to prolong the infusions beyond six or seven hours, instead of twelve, as is generally done. He uses very fine sugar, but instead of dissolving it in the infusion, he previously makes of it a clarified syrup, to which he adds the infusion, in the proportion of twenty parts to thirty-six of the syrup. By this means he obtains a syrup which is much more transparent, and which is capable of being kept longer.

He afterwards fills new bottles with this syrup, and he puts powdered sugar in the necks of the bottles. These bottles are placed on a marble table, in a dry and dark cellar, and confined in iron cases.

This paper concludes by observations on an experiment of M. Gueranger, who had restored the lost colour of some syrup of violets, by means of dilute sulphuric acid. M. Poitevin has not obtained any good result by this means.

DEATH FROM EATING TOBACCO.*

On Tuesday, 6th October, information was received by the superintendent of police that a man was lying dead on board a trow called the Rival, of Gloucester, then lying at Pillgwenlly. On proceeding thither he ascertained that the information was correct, and, on inquiring into the circumstances, he received the following account, which was confirmed by the evidence subsequently at the coroner's inquest. On Monday evening the deceased, whose name was Charles Long, went on shore to a beerhouse, called the Company's Arms, at Pill. He was there joined by the captain of the trow, whose name is James Cooke, and his brother William Cooke. They drank together for some time, when the deceased offered to eat two ounces of tobacco, if any one would bet him half-a-crown. This the captain accepted, when Wm. Cooke, Jesse Franklin (the landlord of the house), and the deceased, went out, and purchased two ounces of roll tobacco. On their return, deceased took a knife and cut up the tobacco into pieces, about an inch in length, and swallowed the whole in two minutes, observing at the same time, that he would swallow two ounces more in three minutes. He then drank four or five glasses of beer, and went on board about seven o'clock. At eleven o'clock he complained of weakness, but appeared to get better; at three o'clock the crew left him and went to bed, and at six o'clock the unfortunate man was a corpse. On Tuesday an inquest was held on the body by W. Brewer, Esq., coroner, when the foregoing facts were deposed to, and the following verdict was returned:—"Died from the effects of eating tobacco, taken voluntarily by himself."

TO CORRESPONDENTS.

The "short sketch" spoken of by a correspondent may be left at our publishers for perusal.

Mr. Wasnidge shall hear from us, by letter, very shortly.

Mr. Caleb Cox, Potterne, Wilts.—The price of drugs was omitted for reasons given in *The Chemist*, No. III.—We may add a word to all those who have written to us on this subject, informing them that the petitions against it are more numerous than those for it. We will bear in mind the concluding part of Mr. Cox's letter.

A Subscriber's observations are taken in good part, but might, we think, have been made in a less assuming tone. In some of his remarks he is decidedly wrong. A Subscriber has not told us anything we did not know before.

Mr. A. Walter's conduct towards us has been very ungentlemanly. We shall not be so taken in again.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month.*

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

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* From the *Monmouth Merlin.*

THE CHEMIST.

I. CHEMISTRY.

ON M. DUMAS' THEORY OF SUBSTITUTIONS AND CHEMICAL TYPES.

BY M. BERZELIUS.

THE new form which M. Dumas has endeavoured to give to the theory of substitutions spoken of in my report for the year 1838, has lately attracted the attention of chemists. Some very important experiments, made by French chemists, on the action of chlorine on the ethers, have been explained by them, relying on this new theory: these explanations, which I do not consider as admissible, have, however, obtained the suffrages of many chemists, amongst whom M. Dumas reckons Professors Liebig and Graham. The author of the theory of substitutions, who nimbly leaps over the objections addressed to him, continues his progress, and has lately given his theory a new development, in a memoir entitled, *On the Laws of Substitution, and on the Theory of Types.*[*] It is not so much by profound views, and unexceptionable proofs, as by eloquent phrases, dictated by his intimate conviction, that he seeks to persuade us. This theory, probably, will exert some influence, at least for a time, on the researches of organic chemistry, and particularly on vegetable chemistry. I will, therefore, here give an account of the new development of the theory of substitutions, and of that of types.

M. Dumas puts the following questions to be answered :—[†]

"1st, In every combination, may elements be replaced, equivalent for equivalent, by simple bodies, or by bodies which act as such?

"2nd, Are not these substitutions often effected without the general nature of the compound being altered? Bodies thus produced belong then to the same chemical type as those from which they are derived.

"3rd, In other cases, may these substitutions furnish products entirely distinct, by their reactions, from those which have given rise to them; and is it, nevertheless, expedient to consider them as belonging to the same molecular type?

"4th, May not the nomenclature of organic substances, from this time forward, be perfected in such a way that the name of each body may express the chemical, or even the molecular type to which it belongs?

"5th, Do the phenomena of substitution oblige us to modify profoundly the value attached, until latterly, to organic radicals?

"6th, Is not the electrical action attributed to the elements of compounds by the electro-chemical theory a complete contradiction of the phenomena of substitutions?"

Before answering these questions, M. Dumas briefly explains the history of the new doctrine. M. Gay-Lussac had remarked, some years ago, that wax, subjected to the action of chlorine, absorbs it, giving rise to a disengagement of hydro-chloric acid gas, without the volume of the gas being changed by the operation. The reason of this is, that the wax loses a volume of hydrogen equal to the volume of chlorine gas which it absorbs. M. Dumas repeated this experiment with essence of turpentine, and arrived at an analogous result. Then it was that, guided by many other experiments, he traced, five years ago, the first sketch of the theory of substitutions conceived in three laws. He now allows that the first and second present exceptions, and entirely rejects the third, which says, that in a hydrated combination, the hydrogen of the water is first removed without being replaced, which is inaccurate according to the formation of chloracetic acid.

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[*] See *The Chemist*, No. III., Second Edition, p. 69.

[†] These questions were given at p. 69; we think it better to repeat them, so that our readers may have the whole subject under their consideration at once.—EDS. CHEMIST.

The conclusions which may be drawn from the somewhat vague manner in which M. Dumas treats these questions are as follows, as to the two first:—

1st, The elements of a compound may, in many cases, be substituted by other elements in equal equivalents, as also by compound bodies which act the part of simple bodies; however, this rule is not without an exception.

2nd, When such substitutions take place, the body, one of whose elements has been substituted by another element, retains its chemical type, and the new element introduced acts the same part as that which has been removed. M. Dumas' reply to the third question is less precise to the purpose, so that it cannot with certainty be said whether it should be considered as affirmative or negative. We shall see proofs of it in that which I shall say farther on. Nevertheless it may be concluded from this reply that where the law of substitutions is looked upon as applicable, the molecular type must be preserved; and if the dissimilar actions of acetic and chloracetic acids with an alkali be compared, it will be seen that the want of resemblance does not appear to hinder the admission of molecular types.

Let us now take a survey of the reasonings on which those answers are based. In order to prove that our ordinary ideas concerning the reciprocal changes of bodies, which he calls the theory of equivalents, are far from being capable of producing what the law of substitutions with the preservation of types is able to realise, he addresses the following question to the theory of equivalents:—What should occur when ether is treated by chlorine? (A question experimentally treated in a very excellent manner by MM. Malaguti and Regnault, to which I shall recur in another part of this report, but which may now be answered by theoretical opinions.) The theory of equivalents may reply, that is not known beforehand; but twenty or thirty combinations are possible, and experiment ought to decide among them. Ask the same question of the theory of substitutions, and it will immediately reply to you: The equivalents of hydrogen, one after another, will successively be changed for equivalents of chlorine, preserving the integrity of the type.

It is easy to demonstrate the little value which such an argument possesses, when it is required to make a deep investigation into a scientific matter. Thus, do we ask the theory of substitutions what will take place when indigo=$C^{16} H^{10} N^2 O^2$ is treated by chlorine? If the theory of substitutions does not give the reasonable reply that M. Dumas makes what he calls the theory of equivalents to do, namely, that experiment will give a solution of it, it will reply:—The hydrogen will be changed, equivalent for equivalent, for chlorine, until no more hydrogen remains. Now, an experiment, to which I shall again refer in the course of my report, shows that the hydrogen is not exchanged at all, but that one atom of indigo-blue may be combined with one or two equivalents of chlorine, without decomposition, forming bodies possessed of totally different properties, which combine with the alkalies, and which act in the new compound as if they contained one of the acids of chlorine or nitrogen.

These are then but words thrown to the wind, when we wish to represent the law of substitutions as a more certain guide in organic investigations, than the ideas commonly received in chemistry; for the provisions of this new theory are, like all partial opinions, true in certain cases, and erroneous in others: it can never with certainty be said beforehand that the substitution of hydrogen, or of another element, for chlorine, will take place, nor, indeed, when it will make compounds of another nature. M. Dumas promises, on the part of the theory of substitutions, things which never can be realised.

I will quote some of his own words to give an idea of the manner in which he treats his subject, and of the kind of proof by which he endeavours to convince such of his auditors or readers as may be less acquainted with the state of the question, than the chemists who do not acquiesce in his views.

"Hitherto, I have reasoned as if the law of substitutions were really applicable only to the substitution of hydrogen, which furnished the first examples of it. But chemists know that, in an organic substance, not only may the hydrogen be replaced, but also the oxygen and nitrogen, as may easily be proved by numerous examples.

"Moreover, carbon may be made to undergo true substitutions, which shows how artificial would be that classification of organic substances, which should be founded solely on permanence of the number of equivalents of carbon in all compounds of the same family.

"In an organic compound, all the elements may therefore be successively displaced and replaced by others. Those which most easily disappear, abstracting certain conditions of stability which it is not yet known how to foresee, are those whose affinities are most energetic. Hence the reason why hydrogen is one of the most easy to be substituted: hence, also, the reason why carbon is one of the most difficult; for we know few bodies which can act on carbon and not on hydrogen.

"I may add, indeed, that the law of substitutions not only permits us to foresee the disappearance of certain, or of all, the elements of the organic compound and their substitution by new elements, but also the intervention of certain compound bodies.

"The law of substitutions is therefore an almost inexhaustible source of discoveries; it guides the hand of the chemist who confides in it, it remedies his faults by showing him the cause of them, and among a multitude of possible but uncertain reactions it points out some which are ready and easy to be produced, and are of the highest interest.

"The future—so rich in realizable facts—so full of accessible discoveries—which the law of substitutions opens to the view of chemists, justifies an expression of M. Ampère. When I was speaking to him of the law of substitutions, he at first confounded it with the reactions of ordinary equivalents; but when I had developed to him the still incomplete views which I then had deduced from it, he said to me,—'Ah! my friend! how I pity you; you have just found work for your whole life!' a prediction which would have been realized, had not so many elevated minds, taking up the law of substitutions, given it an impetus which renders my part of the work less necessary."

The new developement which M. Dumas has given to the theory of substitutions includes the substitution with the preservation of types as an inseparable condition. M. Dumas acknowledges two kinds of type, namely, the chemical and the molecular. It is difficult to decide, from his definitions, whether these two terms signify the same thing, or whether there is a difference in the signification, so that the same molecular type is not always the same chemical type: I will quote his definition:—

"I rank in the same kind, or, what amounts to the same thing, I consider as belonging to the same chemical type, bodies which contain the same number of equivalents united in the same manner, and which possess the same fundamental chemical properties."

M. Dumas has not explained how it must be ascertained whether the same number of equivalents are combined in the same manner, or whether they are combined in a different manner; as to that, he certainly has good reasons, for neither he nor any other chemist has the power of comparing the similar or dissimilar manners in which the same number of equivalents may combine in different compounds. Now, as this question includes the basis of the definition of chemical types, which can be only arbitrary, and which may be differently viewed by two different individuals, the whole idea rests on a basis impossible to be found. This circumstance, of itself, is sufficient to show to what point the ground on which this new theory rests is moving. Nothing so much tends to support what I have just been saying as the following experiment, made with the view of developing its fundamental principles:—

"The definition of the chemical type therefore carries along with it properties which I call fundamental. Now, by what means is a fundamental property recognised? This is a question to which it is easy to reply by examples which will appear conclusive.

"When chloracetic acid is boiled with an alkali, it is suddenly destroyed, and is converted into carbonic acid and chloroform. If we rank, as I have done, acetic acid and chloracetic acid in the same species, we are forced to conclude that acetic acid, treated by the alkalies, in its turn will be changed into carbonic acid gas, and carburetted hydrogen, corresponding to chloroform, into marsh-gas."

We have here then the definition of fundamental properties; but, on a nearer inspection, we shall see that it is simply reduced to an arithmetical axiom, namely: if equal quantities be taken from equal quantities, the remainder will be equal. Perhaps it is less difficult to explain than to define why he has given it the name of *fundamental property*.

M. Dumas has asserted, in his memoir on chloracetic acid, that it partakes with acetic acid the properties of having a very sour taste, of crystallizing, and of being volatilized without decomposition; whence he immediately draws the conclusion that when hydrogen in a body has been changed for chlorine, the chlorine acts in the new compound the part of the hydrogen, and that this new compound possesses, in general, the properties of the body which gave rise to it. M. Dumas on this occasion exults in the excellence of the power of prediction inherent to the theory of substitutions, by saying that the electro-chemical theory never could have produced any thing similar. I have shown by a comparison between the properties of the above acids that they are not more alike than any other two acids. M. Dumas then declared * that I had not taken a right view of his opinion, nor of what he meant by fundamental properties; that it signified that when two atoms of carbonic acid were removed from one of each of two hydrated acids, there remains in the two acids an equal number of elements, constituting by their union two combinations belonging to the same type: so that 2 at. of carbon, 2 at. of hydrogen, and 6 at. of chlorine, in all 8 at. of the two latter, remain from the chloracetic acid, and produce chloroform, $C_2 H_2 Cl_6$, in the same manner as, with acetic acid, 2 at. of carbon and 8 at. of hydrogen give marsh gas, $C_2 H_8$. Moreover, in order that these two very different bodies, which have no point of resemblance beyond the number (10) of their elementary atoms, may be looked upon as belonging to the same chemical type. M. Dumas converts 2 at. of $C H_4$ into 1 at. of $C_2 H_8$, without having any other reasons for doubling the atomic weight than to sustain his doctrine, which otherwise must fall to the ground. It is therefore evident that, with respect to the question of chemical types, *the combination of atoms among themselves in a similar manner* is but a simple arbitrary supposition, which may be made in different manners by different persons, and that the positive point of fundamental properties rests only on a numerical relation; being of the same type, on the contrary, is only an arbitrary supposition.

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* *Comptes Rendus de l'Académie des Sciences,* 1ere Semestre, p. 814.

If, on the other side, we make positive comparisons, if we eliminate the water of the two acids, and consider them in their combination with potassa, for example, in order that the theory of substitutions may have the slightest appearance of reality, the products of the destruction of bodies of the same type must be of the same type among themselves. We have seen chloracetate of potassa converted by hydrate of potassa, assisted by boiling, into carbonate of potassa and chloroform. But if you treat acetate of potassa in the same manner, the acetic acid remains unaltered. That seems to be a true fundamental property. An acetate submitted to dry distillation gives acetone. It is not yet known what chloracetate of potassa produces by dry distillation, but, in all probability, the product resembles acetone as little as carburetted hydrogen does perchloride of formyle. To obtain carburetted hydrogen from an acetate the latter must be heated, in the state of hydrate, in a distillatory apparatus, with three or four times its own weight of caustic baryta, and even then it is not obtained unless the salt or the base contains exactly one atom of water for each atom of acetate of potassa.

In order to illustrate what M. Dumas means by a chemical type, we may here give some examples which he himself gives, and in which I will write the formulæ, making use of the equivalents for the sake of greater simplicity:—

Formic acid	$C^2 H O^3$
Oxide of methyle	$C^2 O H^3$
Chloroform	$C^2 H Cl^3$
Carburet of hydrogen, at least	$C^2 H H^3$
	$C^2 H \left\{ \begin{matrix} H \\ Cl^2 \end{matrix} \right.$
Perchloride of carbon	$C^2 Cl Cl^3$

These are combinations which contain the same number of equivalents, six in each case, and which contain 2 at. of carbon in the first term; the second term is composed of only one equivalent, which may be oxygen, hydrogen, or chlorine, according to which is best adapted to the object proposed. In the third term there are three equivalents, which may be either oxygen, hydrogen, or chlorine. If one single element be not sufficient for completing the third term, the latter may contain one or two equivalents of one or other element: we have given an example of this in the formula which is not preceded by any name. It is not by any means necessary that a type should contain *three* elements; it may contain two or four. The parts which the elements act in a combination do not depend on the nature of those elements, as we shall see farther on, but on their position in the combination. Thus, in the preceding example, the hydrogen of formic acid acts the same part as the oxygen in methylic acid, and the hydrogen of the latter the same as the oxygen in formic acid. So that oxide of methyle is no other than formic acid, or what the oxygen is in the one, the hydrogen is in the other, and *vice versâ*. Now, when a combination contains only two elements, then its atom is multiplied until the sum of its equivalents equals 6, as was done with marsh-gas. In the fourth formula, and in the perchloride of carbon in the last, the atoms are divided in order that there may be one equivalent in the second term, and the three others in the third. Thus the perchloride of carbon is formic acid, or oxide of methyle, the hydrogen of which is changed for chlorine: marsh-gas is formic acid, or oxide of methyle, whose oxygen has been replaced by hydrogen. But M. Dumas has omitted to indicate here the whole extent of the power of the theory of substitutions: we have seen that all the elements of an organic substance may be changed, even to the carbon: if, then, in $C^2 Cl Cl^3$ we replace the carbon by chlorine, we shall have $Cl^2 Cl Cl^3$, or, in other words, gaseous oxide of methyle, in which all the elements are replaced by chlorine.

On reflecting on the formation of molecular types, I at first thought it was only a *plaisanterie*, but M. Dumas took care to drive away every idea of that nature, by giving the manner in which the question must be looked at.

"It will be remarked how, in this long series of researches, the force of experiment has been gradually raised from an obscure corner of science to the most general ideas of natural philosophy."

I have long been curious to know M. Dumas's opinions with respect to organic radicals. It is well known that there was a scientific discussion between MM. Dumas and Liebig, as to whether ether ought to be considered as the oxide of an organic radical, or indeed, as M. Dumas contended, a combination of 1 at. of etherine, $C^4 H^8$, with 1 at. of water. After an oral debate between these two distinguished chemists, they both adopted the first of these opinions, and M. Dumas, in their name, communicated to the Academy of Sciences an opinion concerning the composition of organic bodies, considered as containing compound radicals combined with oxygen, haloïd bodies, &c., &c. On this occasion M. Dumas asserted that he had been for ten years occupied in investigations the object of which was to develope this theory. It is to be regretted that he has not as yet communicated any of his researches to the learned world. Since the exposition made in concert with M. Liebig, M. Dumas has shown us nothing tending to extend our ideas concerning radical compounds. His works on the tartaric and citric acids, and on the theory of substitutions, have been of a nature to make us suspect that he was less satisfied with that opinion. On this occasion he also expressed himself in so vague a manner, that for my part I am at a loss to comprehend what he means by a compound or organic radical. I will quote his own words.

"It is known that by organic radicals, we mean to designate compound bodies which may be functioned in the manner of simple bodies, and which, like them, and according to the same laws, enter into combination with the various bodies of nature. If, by organic radicals we would imply bodies analogous to cyanogen, amidogen, and to oxalic or benzoic radicals, no doubt they are, indeed, compound bodies which have the function of simple ones, like the analogous bodies in mineral chemistry—oxide of carbon, sulphurous acid, binoxide of azote, and nitrous vapor. But if, by organic radicals, as M. Berzelius wishes, we must designate certain invariable compounds which act the part of metals, the theory of types, quite admitting their concurrence, cannot admit their permanence.

"Thus, in order to fix the ideas, in the theory of types, the essence of bitter almonds is a type in which, for one equivalent of hydrogen, an equivalent of chlorine, of bromine, of iodine, of oxygen, or of amidogen, may be substituted, without the type being altered.

$$\begin{array}{c} C^{14} H^6 O^2 \\ C^{14} H^5 O^2 \\ Cl \\ C^{14} H^5 O^2 \\ O \\ C^{14} H^5 O^2 \\ S \\ C^{14} H^5 O^2 \\ NH \end{array}$$

"But admitting that the system $C^{14} H^5 O^2$ may be replaced by an element, the theory of types does not regard it as an invariable group."

If now we have not any *eclaircissement* concerning what M. Dumas means by organic radicals, at least we have learned that in the theory of substitutions, the equivalent of hydrogen may be replaced by two equivalents of the same element, provided that an equivalent of nitrogen be added. The law of substitutions is indeed the product of a very *liberal*, I might almost say, *radical* legislation.

In order to make it felt that our present chemical nomenclature is inexplicable as regards organic combinations, M. Dumas proves that it is founded on a false system of dualism—on an antagonism in the nature of the bodies which combine—a herald of the electro-chemical system which was afterwards developed. According to the theory of substitutions, organic substances ought to be classed in types corresponding to genera, and in species, after the manner of natural history. He quotes for example: acetic acid, chloracetic acid, ether, chlorether, olefiant gas, and chlorolefiant gas. It would have been particularly instructive had he given the names which he has formed for the genera which we have seen above. M. Dumas is not so opposed, this once, to electro-chemical opinions, as he is in his memoir on the formation of chloracetic acid. It is now no longer necessary to be an adversary to the theory of substitutions to defend the electrical relations of elements. He acknowledges them. They may exert some influence at the moment when the combinations are formed and destroyed, but when once the elements are combined, nobody knows what part each element takes in the compound body. M. Dumas declares that he does not dispute *my* electro-chemical ideas. I have committed the error of suspecting that the nature of combinations depends on the nature of the elements; showing him, on the contrary, that the nature of the elements goes for nothing, and that the influence of the elements on the properties of combinations depends only on their position. Such is, according to him, the difference between our opinions. As the question concerning the position of elements might not seem very clear, since nobody can see how they are placed, M. Dumas has given the following example:—

Oxide of ethyle $C^4 H^5 O$.	Oxide of methyle $C^2 H^3 O$.
Acetic acid $C^4 H^3 O. O^2$.	Formic acid $C^2 H O. O^2$.

Acetic acid, therefore, is oxide of ethyle, and formic acid, oxide of methyle, in which two atoms of oxygen are placed like hydrogen, which signifies that they act like hydrogen. This position then is so clear as to preclude the possibility of mistake. We have above seen that formic acid is $C^2\,H\,O^3$, and oxide of methyle $C^2\,O\,H^3$; the position of the elements is therefore variable according to circumstances, without any change in the properties of the body constituted by their combination, and that again according to the theory of substitutions, it certainly is very convenient, and renders the theory very much more *manageable.* It is much to be regretted that the properties which depend on the position of the elements do not allow themselves to be *managed* like the position of the atoms in the formulæ. The only objection which can be made to this mode of demonstration is, that these are only formulæ, and indeed very arbitrary ones; but the theory of substitutions considers objections of this nature as valueless.

This doctrine has not met with general approbation, either in the Academy of Sciences at Paris, or out of it. The older French chemists have not thought the thing worth the trouble of their speaking about, so that young chemists only have accepted the defiance.

M. Pelouze has made objections to the theory of substitutions, as laid down in the Memoir on chloracetic acid, which are founded on experiments, and which have given rise to the Memoir of which I have been speaking. He has shown by experiment that the decomposition of aqueous acetate of soda by caustic of baryta, with the production of $C\,H^4$, is a general property of all bodies composed of carburetted hydrogen and oxygen, such as acetic acid, formic acid, alcohol, and many others, and that it is by no means a product of decomposition proper to acetic acid alone.

He has proved, besides, that in using hydrate of baryta for this decomposition, we obtain, as may easily be understood, nothing but pure hydrogen, instead of carburetted hydrogen, provided that the water in the hydrate is sufficient. The preceding fact, therefore, does not support the theory of substitutions and its types. The great number of substitutions of which this theory boasts, are nothing but ordinary exchanges of equivalents, like all those which take place between the elements of bodies in reciprocal changes, without our being enabled to foretel when the substitution will take place, and when it will not, without any connexion with the types which M. Dumas proposes, and in which the number of atoms may be arbitrarily doubled, as in the example where he substitutes $C^2\,H^8$ for $C\,H^4$: there exists no positive character in support of the preservation of types: all is hypothesis, and M. Pelouze, in my opinion, has taken a very correct view of the subject.

M. Persoz has claimed, as one of his discoveries, the formation of $C\,H^4$ in the decomposition of the acetate of potassa by dry distillation with an equal atomic weight of hydrate of potassa. He has shown that acetone, in the nascent state, is decomposed by the water of the hydrate of potassa whose hydrogen and oxygen enter into new combinations, into carbonic acid which combines with the base, and $C\,H^4$ which escapes in the state of gas. According to my opinion, it is not the substitutions, but the *theory* of substitutions which should be rejected.

MM. Laurent and Baudrimont have made reclamations of priority. The mention of these reclamations belongs rather to the history than to a relation of the progress of science: so I shall pass them by in silence. M. Laurent has for some years defended the theory of substitutions, in the same manner as M. Dumas has since done. M. Baudrimont rejects the theory of substitutions, and looks upon the substitution only as a simple exchange of equivalents.

M. Gerhard has made an attempt with the view of proving according to M. Dumas' law of substitutions, the manner in which organic bodies combine with oxides and inorganic acids. There are two kinds of combinations:—1st. Those in which the oxide loses its capacity of saturation, such as sulpho-benzide, nitro-benzide, &c., &c. They belong to the type benzine$=C^{12}\,H^6$, sulpho-benzide is $C^{12}\,\substack{H^5\\ S\,O^2}$, and nitro-benzide $C^{12}\,\substack{H^5\\ N\,O^4}$; in the first, one equivalent of hydrogen is replaced by an equivalent of sulphurous acid, and in the second, by an equivalent of nitrous vapor. 2dly. Those in which the oxide or inorganic acid retains its capacity of saturation, in which there is no substitution, but in which the inorganic acid is combined with the organic body in a new manner, which may be called the *coupling* (*accouplement*) of the organic body, the latter taking the name of *couple* (*copule*). When it happens that a part of the acid loses its capacity of saturation, there is at the same time a substitution and *coupling*, in sulpho-benzoic acid $C^{14}\,H^4\,S^2\,O^7$, for example. It is composed of one atom of benzoic, and one atom of sulphuric acid, which saturate one atom of base each, separately; but in this benzoic acid one equivalent of hydrogen is replaced by an equivalent of sulphurous acid$=C^{14}\,\substack{H^5\\ \ddot{S}}\,O^3$.*

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* I have shown in the report of 1839, p. 390, that this acid is $C^{14}\,H^8\,O^2+2\,\underline{\dot{H}}\,\dddot{S}$, and in the present report I shall have occasion to speak of benzoic acid, which, under the

We have therefore seen "this future,—so rich in realizable facts,—so full of accessible discoveries, which the theory of substitutions has opened to our view."

ON THE RELATION OF FORM TO CHEMICAL COMPOSITION.*

BY DR. SCHAFHAEUTL.

In a former paper Dr. S. had given a new mode of obtaining graphite, in which it was also shown that all graphites owed their origin to the operation of the same causes; namely, the contact of bitumen, or any similar substance, with a silicate, under a certain limited degree of heat; it was further maintained, that the compound nature of graphite might be satisfactorily shown, by subjecting it to the action of hydro-fluoric acid, which, combining with the silicon, set free the carbon of the graphite as a hydruret, which was then consumed in the flame of a lamp. The object of the paper read on the present occasion was to explain the circumstances under which certain modifications of form take place in this peculiar substance, (as also in others generally considered elementary,) and to demonstrate their connexion with changes of an entirely chemical nature.

A beautiful specimen of a formation of graphite, obtained from the Neath Abbey iron-works, in South Wales, was exhibited to the Section; it seemed to be composed of an infinite number of foliated scales overlapping each other, like the slates of a roof; each scale being so thin, as to be agitated by the slightest breath of air: a second specimen was exhibited of a graphite leaf, where it appeared as a globule of much greater size, the laminated structure still existing in beautiful developement. In a third stage, the scaly structure disappeared: the globule having assumed a more porous and coke-like form. Dr. S., after objecting to any explanation of these curious changes of form, founded merely on molecular alterations, proceeded to detail certain experiments, from which he deduced conclusions of an interesting and important nature.

The discovery of a new method of decomposing crystallized graphite, by heating it in concentrated boiling sulphuric acid, and adding a little concentrated nitric acid, afforded a series of singular and instructive phenomena. After the evolution of binoxide of nitrogen had ceased, each scale of graphite was converted into the globular substance before described; its external metallic lustre remaining unimpaired, but its bulk so greatly enlarged, that what before appeared a single scale, became, by the separation and division of its component laminæ, a thick spongy tissue, capable of being restored to its former compressed foliated form, by pressure with the finger nail. That this change of form, however, was not merely a mechanical effect, appears from the following experiment:—

Graphite scales having been repeatedly treated with muriatic acid, washed, and again digested in a strong solution of caustic potash—in order to remove all possible mechanical admixtures of iron, silica and alumina—were then submitted to the process above described; the evolution of nitrous gas having ceased, an equal quantity of water was added to the mixture; immediately there succeeded a rapid evolution of bubbles from the globules of graphite, which at first lay at the bottom of the fluid; becoming lighter, as this evolution of bubbles proceeded, they gradually rose to the surface, when the gas immediately ceased to be evolved; the acid or the graphite must have been combined with hyponitrous acid, which, being decomposed by the water, was liberated as nitrous gas.

The globules when washed, dried, and weighed (at first weighing but 2·01 grs.), had increased in weight 5·02 grs. Being then put into a flat covered dish of brass, and accurately weighed, the cover was removed, the globules immediately lost weight, and so rapidly, that in removing them from the dish, 0·18 grs. were lost; the dish was covered with a dew, apparently of an acid nature, as it acted on the brass. These globules, heated on paper until it became slightly tinged with yellow by the heat, now disengaged dense fumes, the paper being streaked with a blackish coloured smoke where it was in contact with the graphite; 2·30 grs. were lost during this process, which being repeated a second time, they were found to have lost 2·25 more. Finally ignited in a platinum crucible, dense fumes, without any perceptible odour, were given off, the weight of the globules being reduced to 1·86 grs. After which, no further reduction took place during ignition for half an hour in the open air. The total loss of the 2 grains thus experimented upon with the acid, was 6·96. In a former paper by Dr. Schafhaeutl, this loss was attributed to disengagement of carbonic acid gas during this conjoined action of the acids; but it would appear from the last experiment, that there

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influence of nitric acid, gives rise to a combination corresponding to $C^{14}\,H^{8}\,O^{2}+\underline{\dot{H}}\ \underline{\overset{\cdot\cdot\cdot\cdot\cdot}{N}}$, but which saturates only one atom of base.

* *British Association:* Glasgow meeting, Sept. 1840. From the Report given in *The Athenæum.*

is formed a compound of sulphuric acid, nitric acid, carbon, hydrogen and oxygen, volatilizable only at high temperatures.

The question here arises, how can this rapid loss of weight be accounted for? During the previous drying process, which was conducted at 212°, the loss of water must have been accompanied by a change of chemical composition, and the new compound, by attracting water or oxygen when in the pan, must have formed an exceedingly volatile combination, evaporating as rapidly as it was formed.

By a repetition of this treatment with the acid, graphite in the third stage, as before described, was obtained; the metallic lustre was entirely destroyed, as also was the laminated structure; it now appeared as a porous mass, resembling coke, and no longer capable of reduction to its original foliated state by pressure, having undergone a decided chemical change. The acid solution deposited at once a copious precipitate of silica and alumina, slightly tinged by oxide of iron, on the addition of sufficient ammonia to neutralize it. A similar precipitate was obtained from the acid of the first experiments, but less in quantity, and requiring a longer time for its operation.

Thus it would appear that the abstraction of silicon and the change of physical properties of graphite, are corresponding and mutually connected phenomena.

In further proof of the necessary connexion of silicon as a chemical combination, essential to the existence of the scaly metallic lustre of graphite, it will be found that by repeating the same experiments, the globules ultimately disappear, and the remaining solution in acid neutralized by ammonia, deposits only flaky silica, with traces of oxide of iron. On attentively observing the specimen of graphite, as found in its natural state, and comparing it with those treated with acids and alkalies, also exhibited, it appeared that the scales, before being operated on, had a dirty greyish appearance, described as owing to their being covered with spots, consisting of microscopic six-sided flattened prisms of silicate of iron; the matrix of this graphite formation, in the blast-furnace cinder, essentially composed of bisilicate of lime and alumina, deriving a yellowish tint from a slight admixture of sulphuret of calcium, with a trace of sulphuret of potassium. Scales of very different density may be separated, the thinnest not affected by the magnet, the thicker ones decidedly so; those in the middle of the mass, thicker and stiffer, not easily broken, and showing a shining black fracture, like that of anthracite, form a variety of graphite, in which silicon and iron greatly predominate, developing, when treated with hydrochloric acid, a fetid hydrogen characteristic of cast iron, and separating at the same time yellow flocks of silica and alumina.

Dr. Shafhaeutl then proceeded to indicate an analogy between the formation of grey iron in the blast-furnace, and that of graphite; namely, that the same chemical conditions occur during the change of white iron into grey; this takes place after having descended through the furnace, and reached the stratum of slag covering the melted metal; this slag being an earthy bisilicate (in coke furnaces, approaching to a trisilicate), and containing a small quantity of protoxide of iron. As silicon is found in graphite only in very small quantity, it has been considered an accidental impurity, just as the small quantity of hydrogen retained by charcoal, sulphur, &c. has been considered as impurity; but as these foreign matters can be separated by no chemical means, without destroying the state in which graphite, charcoal, and sulphur exist, it must necessarily be inferred that such admixture is essential to their existence in that state in which they ordinarily occur.

Quitting the individual consideration of graphite, the author extended the principle here argued to certain other substances, generally considered as simple bodies. For example, sulphur obtained by the decomposition of sulphurets by acids, is white in colour, and invariably combined with a stable quantity of hydrogen. But obtained from hyposulphites, it is as invariably yellow, and the presence of free hydrogen in the slightest quantity, bleaches the precipitate.

The known case of sulphur precipitated under the presence of sulphuretted hydrogen, and cautiously mixed with metallic copper in its utmost state of minute division, being found to combine directly, evolving a dull red heat, has been considered an exception to the law, that no two dry bodies unite without the intervention of a third; but sulphur precipitated from hyposulphites, will not thus combine, nor will pure sulphur, though subjected to the minutest division possible. The same sulphur, however, brought in contact with hydrogen, under a pressure of four atmospheres, and then quickly mixed, is found to combine, as in the first instance, but if exposed to the air, its power of combination is again lost; thus, a third body is proved necessary here, as in all cases. And further, the author doubted if one of the two different crystalline forms of sulphur is not owing to the presence of hydrogen, which he found to be in combination with it in a very perceptible quantity.

These peculiar forms of combination, where a few atoms of one body are combined with many atoms of another, may perhaps be considered as forming a class of compounds intermediate between the inorganic and the higher organic compounds: thus, the compounds of arsenic acid form a very striking example. In the subarseniate of iron, 50 atoms of iron are combined with only 3 atoms of arsenic acid and 75 of hydrogen. So again, 24 atoms of arsenic with 1 atom of sulphuret of potash in sulpho-arseniate of potassa. By gradually passing from compounds of inorganic chemistry to those of organic chemistry, we find diacetate of copper with water, 48 atoms of oxide of copper combined with only 1 atom of hydrogen and 12 atoms of water. And finally, in the field of organic chemistry itself, we have, for example, margaric acid, composed of 67 atoms of hydrogen, 35 carbon, and 3 of oxygen only. In oleic acid, 120 atoms of hydrogen are combined with 70 of carbon and 5 of oxygen; in stearic acid, 134 atoms of hydrogen with 70 of carbon and 5 of oxygen, &c. The author formerly hinted that the principal circumstance which tended to produce compounds of such multiplicity of atoms, or, in fact, organic compounds, was the separation of the particles of bodies brought into action by the capillary powers of the vessels of organic structures. It was probable that the chemical action of these separated molecules must be a different one from their action, when arranged into one definite form; and as a proof that once received laws of affinity were exhibited only under peculiar circumstances, he directed the attention of the Section to H. Rose's compound, formed by the direct combination of 29·97 per cent. of ammonia with 70·03 per cent. of sulphuric acid, which ought to have produced anhydrous sulphate of oxide; but after combination, neither sulphuric acid nor ammonium could be detected in the compound. The same chemist found combinations of anhydrous sulphuric acid with the chlorides of ammonium, potassium, sodium, and the nitrate of potassa.

According to the laws of affinity, for example, in the last case, the nitric acid ought to have been displaced, decomposed, and driven away by the more powerful action of sulphuric acid; but no tendency to the displacement of chlorine or nitric acid was shown, and new compounds, different from all hitherto known, resulted. As no combination of anhydrous sulphuric acid took place with oxide of calcium, chloride of barium, or chloride of copper, he concluded, that these above-mentioned combinations were formed by replacing one double atom of hydrogen, water, or chlorine, in order to form a bisulphate of potash, soda, or ammonia.

Dr. S. seemed to believe, that there existed two different states of chemical combination; the first in which the chemical forces of molecular attraction were acting only according to the relative quantities of matter; the second, where, under the always catalytic presence of a third, the elementary substances arranged themselves, separating in groups according to the resultant electric forces of the centres of action created by the above-mentioned presence of a third, acting differently on the different molecules of bodies in contact, in a somewhat similar way to a solution, which does not crystallize unless the molecular equilibrium of the liquid is disturbed. The first state of chemical combination might, perhaps, have some distant relation to Dumas's law of types; the second state,—a mere consequence of the first,—would be represented by Berzelius's electro-chemical combination.

The author, at the same time, referred to Prof. Graham's admirable papers, in which the Professor had so distinctly pointed out the great and *peculiar* part which matter performs in solid chemical combinations, and remarked, that during all chemical combinations where a third body is separated, the precipitation would take place only when a certain quantity of water was combined with the body to be precipitated, which water separated in the relation to the separation and consolidation of the precipitate only, and could be driven away from it only by applying a red heat.

NEW METHOD OF PREPARING MORPHIA AND ITS SALTS.*

BY DR. MOHR, OF COBLENTZ.

The plan adopted by Dr. M. for separating morphia from narcotine and all other heterogeneous substances, consists in dissolving it in an excess of caustic lime, and precipitating it by muriate of ammonia. This method of precipitation is, in principle, very similar to that of alumina, from a solution in caustic potash. The process is as follows:—

The opium is boiled in water, in which it readily dissolves; the decoction is strained through linen, and the dregs are pressed; this operation of boiling and straining is repeated twice on the same quantity of opium, and the solution of the whole is concentrated until its weight amounts to four times that of the opium employed. While still warm, the concentrated solution is mixed with milk of lime, prepared with a quantity of dry lime, equal to one-fourth of the weight of the opium. The mixture is heated until it boils, and is strained while hot. The filtered liquor has a light brown yellow color. While hot it is mixed with pulverized sal ammoniac in excess; the lime is saturated with muriatic acid, ammonia is set free, and the morphia is precipitated. When the solution is greatly concentrated, the precipitation is immediate, and almost equal in volume to half the solution. When, however, the solution is less concentrated, there is at first no precipitation, but as the liquor cools, open needles appear, and at a certain period a large mass of precipitate is suddenly formed.

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* Read to the Chemical Section of the *British Association.*—From *The Athenæum.*

The peculiarity of this process is, that it affords a weil crystallized and fine product of morphia, without requiring the use of alcohol. This is owing to the circumstance that the ammonia is not added in a free state, but is generated in immediate contact with the substance to be acted upon. The morphia is nearly colorless; by dissolving it in muriatic acid, and subjecting the solution to crystallization, we obtain muriate of morphia in perfectly white and quite pure crystals. It is to be observed, that the milk of lime must not be added to a boiling hot solution of crude opium, otherwise the precipitate adheres to the sides of the vessel, and does not afterwards perfectly re-dissolve. The liquor containing the morphia should be either cold or only luke warm when the milk of lime is added to it. If it is boiling hot it must be added to the milk of lime, and not *vice versâ*.

Dr. Gregory observed, that this was an excellent method of preparing morphia on the small scale and for class-room experiments, and complimented the author on his knowledge of the English language, in which the paper was written.

ON THE FORMATION AND PREPARATION OF BLUE OXIDE OF TITANIUM IN THE DRY WAY, AND ON THE CAUSE OF THE BLUE COLOR OF MANY SCORIÆ FROM HIGH FURNACES.*

BY CH. KERSTEN, OF FREIBERG.

Far advanced as is our knowledge concerning the composition and properties of titanic acid, our acquaintance with the blue body which zinc, iron, and tin produce in solutions of titanium is proportionately scanty; it is for the most part reduced to simple conjecture. Mr. Kersten has made many experiments on this subject, which have demonstrated that titanium may be presented at a lower degree of oxidation than that of titanic acid, and that the blue body, which, hitherto, could be prepared only by the humid way, and whose existence was still problematic, may be obtained in the dry way. This body is produced in several ways:—

1st, By passing vapors of zinc over titanic acid heated to whiteness. This acid then acquires a dirty blue color, but it loses it and again becomes white, when put in contact with oxygen at a high temperature.

2nd, By putting in a porcelain crucible metallic zinc, or oxide of zinc, mixed with charcoal, then covering the whole with titanic acid or a titaniferous earthy silicate, and heating the crucible, which must be well closed for several hours at a red heat. Thus will be obtained melted masses of a lavender color; they are opaque, and contain, besides oxide of zinc, blue oxide of titanium.

3rd, By fusing at a white heat, and out of contact of the air, various titaniferous combinations; for example, the titaniferous silicates of lime and alumina with iron. These silicates, which at first are colorless, become more or less blue.

4th, By treating the same titaniferous silicate, in the same manner, with metallic tin. A small addition of charcoal seems to facilitate the formation of the blue glass.

5th, M. Kersten has found that titanic acid may be reduced, under certain circumstances, by means of hydrogen, to the state of blue oxide of a very fine color. If very fine titanic acid be added to bi-phosphate of soda in a state of fusion, in a porcelain crucible, it is very easily dissolved at a gentle heat, and a white transparent mass results. If this mass be introduced into a bowl made of not very fusible glass, and heated to a high temperature, and if hydrogen dried by means of chloride of calcium, be driven into it, the saline mass very soon acquires at the surface a beautiful lavender color. If the residue be afterwards digested in water, the phosphate is dissolved, and blue oxide of titanium remains. A portion of this oxide was exposed to the air for two months, without losing its fine blue color. Oxide of titanium, thus prepared, is unalterable in the air, at the ordinary temperature; but, heated to redness in contact with the air, or oxygen, it is converted into a white powder—titanic acid. At the ordinary temperature this blue compound is not acted on by hydrochloric acid; but, heated with it, it loses its color, and is converted into titanic acid. Zinc, tin, and iron, steeped in this liquor, reproduces the blue oxide.

6th, If pure zinc be placed at the bottom of a porcelain crucible, and then covered with a mixture of titanic acid and biphosphate of soda, or, what is still better, the result of the fusion of these two substances, and if the crucible be strongly heated for several hours, a blue, or sometimes violet, saline mass is obtained, which readily dissolves in water, leaving the blue body as a residue, mixed with a little oxide of zinc, which was not dissolved in the alkaline phosphate.

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* *Annalen der Physik und Chemie*, vol. xlix. p. 231.

7th, If, instead of zinc, tin or iron be employed, the results are the same.

By the two last methods, however, the oxide obtained is less pure and of a less beautiful color than when titanic acid is reduced by means of hydrogen.

As in analyzing the various blue scoriæ of iron, coming from different countries, the author had found small quantities of titanic acid, and as these scoriæ had a color similar to that of the blue oxide prepared in the dry way, he presumed that this color, instead of arising from the protoxides of iron or manganese, which are sometimes found in these scoriæ, proceeded from titanic acid. From the above facts, it is very probable that titanic acid, which is very frequently met with in iron mines, after having been dissolved and reduced to scoriæ during the smelting, was afterwards reduced to the state of oxide by the liquid iron, as occurs in the humid way in solutions, and in many of the foregoing experiments. If this presumption be true, we should be able, with the substances ordinarily contained in the scoriæ and titanic acid, to reproduce blue glass. The following up of this idea, carried on with perseverance, has given very good results. M. Kersten has not only succeeded in fusing together silica, lime, alumina, titanic acid, and iron, all pure, producing blue glasses, and which entirely resemble many blue scoriæ of iron, but he has also been able to obtain it with the same earths, titanic acid and zinc deprived of iron, or pure tin. He concludes, therefore, with the conviction, from all his investigations, that the blue coloring matter of many iron scoriæ is blue oxide of titanium.

The author has endeavoured to make use of this blue oxide for producing colors on porcelain; and if they do not possess all the beauty of those of cobalt, they come nearer to it than any other blues.

NEW COMPOUND OF ARSENIOUS AND SULPHURIC ACIDS.*

BY DR. SCHAFHAEUTL.

This was obtained from the smoke of copper calcining furnaces near Swansea, in South Wales. The new compound was another singular instance of an anhydrous crystallized body being deposited under the presence of water only, and was a remarkable proof of the unlimited number of different forms of combination, which might be produced even in inorganic nature, by bringing chemical substances in contact under various circumstances.

The copper ores smelted in South Wales, are for the greatest part copper pyrites, mixed with iron pyrites, grey copper ore, &c.; in fact, a mixture in which the sulphurets of copper, iron, arsenic, antimony, cobalt, nickel, zinc, and tin, were invariably found together. Sulphur and arsenic escape from these ores during the calcining process, as sulphurous and arsenious acids, and have been found to destroy all vegetation for miles round the copper works, without affecting animal life in the slightest degree. By bringing the escaping fumes in contact with steam, and driving it through burning charcoal, or subjecting it only to a great pressure in contact with steam, the new solid compound was deposited on the cool surfaces of the chambers connected with the calcining furnace. It was deposited in beautiful crystallized leaves or tables, perhaps belonging to the same class as Wöhler's dimorphous modification of the crystallization of arsenious acid, the regular form of which belongs to the octahedron.

It was found to consist, in 100 parts, of:—

Arsenious acid	68·250
Sulphuric acid	27·643
Protoxide of iron	3·029
Oxide of copper	0·420
Oxide of nickel	0·656
	99·998

Corresponding to

Metallic arsenic	51·741
Sulphur	11·095
Iron	2·339
Copper	0·336
Nickel	0·516
Oxygen	33·971
	99·998

These crystals attract moisture from the air with great rapidity and with evolution of heat, corroding animal and vegetable substances as powerfully as concentrated sulphuric acid. Their taste is pure, but extremely sour, similar to sulphuric acid, and, when dissolved in water, the remainder of 100 parts of these crystals was only 17·436 grains. The shape of the crystals was perfectly retained, only their appearance was changed from transparent into opaque. Their chemical composition was found to be:—

Arsenious acid	16·778 grs.
Oxide of nickel	0·656
	17·434

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* *British Association:* Glasgow, 1840.

What the water had dissolved consisted of:—

Arsenious acid	51·472
Sulphuric acid	27·643
Protoxide of iron	3·029
Oxide of copper	0·420
	82·564 grs.

One of the remarkable changes which occurred during the formation of this compound, was the conversion of sulphurous into sulphuric acid, as well as the presence of iron, copper, and nickel, in a deposit from gaseous matter. No other definite compound of arsenic acid with another acid seems to be known, except those with the organic tartaric and paratartaric acids.

ACTION OF AIR AND WATER ON IRON.*

BY MR. MALLET.

Mr. Mallet stated in a general manner the nature of the principal practical results which he has obtained, with respect to the durability and modes of protecting cast and wrought iron, or steel, under various conditions, when exposed to the corrosive or chemical action of air and water, whether fresh or salt. These researches have been made under the sanction of the Association, and are still in progress. Numerical results have already been obtained (*Athen.* Nos. 566-8) of the absolute and relative durabilities of about one hundred varieties of cast iron and wrought iron, in each of the following conditions as to water, viz. :—

In clear sea or ocean water; in foul sea water, as in the harbours of large cities; in clear river water; in foul river water; in sea water at high temperatures; in sea water at various depths; in sea water of variable saltness. The results in all these cases are given in voluminous tables, arranged in such a manner as to enable the engineer to predict with confidence the durability of a given scantling of iron of a given sort, under given circumstances.

The conditions of corrosion of iron, in contact with copper, with zinc, and with tin, and with various atomic alloys of these, have been determined, and printed tables of the results distributed to the Section. Results are also given as to the relative protecting power of several paints or varnishes, to the surface of iron exposed as above The specific gravities of all the irons experimented on, have been taken by a new method, and the increment of specific gravity due to increased depth (or head of metal) in castings determined, and also the decrement of specific gravity due to increased bulk or scantling of castings determined.

These are necessary data to the foregoing investigation, and are in themselves of importance to the engineer, with reference to the ultimate cohesion of cast iron, which seems to be related, and probably is some function of the specific gravity in any given case. The experiments are now extended to wrought iron and steel; a final report is proposed, to consider the nature of the chemical changes induced on cast and wrought iron by the action of sea water, and to complete the numerical results now given, which have lately been in several instances submitted to control, or tested by the actual corrosion of castings recovered from the wrecks of the *Edgar* and *Royal George*, &c. and found strikingly to coincide.

ON THE COMPOUND, OR RADICAL CALLED KAKODYL.†

BY PROFESSOR BUNSEN, OF MARBURG.

The object of this paper was to describe a new radical resembling alcohol, in which arsenic replaced the oxygen of that compound. This radical enters into numerous combinations, forming, with oxygen, a peculiar acid called kakodylic acid. The oxide of kakodyl has so great an affinity for oxygen, that when exposed to the air it immediately inflames. The bodies produced by the combustion are arsenious acid, carbonic acid, and water. By the further oxidation of the oxide of kakodyl, kakodylic acid is produced. The sulphuret of kakodyl is similar in composition to the oxide, and participates in many of its properties. The telluret, seleniuret, iodide and bromide of kakodyl were also examined. The danger attending these experiments is very great, and the poisonous effects produced by the inhalation of the vapour were described as dreadful. Kakodyl is produced from the liquor of cadet, and is extremely interesting as being a link connecting organic and inorganic chemistry. Professor Bunsen is engaged in further experiments on this subject, and has already obtained many new combinations.

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* *British Association;* from *The Athenæum*, in which journal our readers will find very full reports of all the papers read to the various Sections of the Association, at the Glasgow Meeting.

† Read to the Chemical section of the *British Association.*

INVESTIGATIONS CONCERNING SULPHURET OF CARBON.*

BY M. COUERBE.

From the numerous experiments and analyses detailed in this memoir, it results:—

1st. That the xanthates of potassa and lead act differently when exposed to the action of heat; while xanthate of potassa gives a mixture of polysulphuret of potassium and carbon, xanthate of lead gives a residue of simple sulphuret and traces of carbon, about two per cent.

2nd. That xanthate of lead, a compound of ether, oxide of lead, and sulphuret of carbon, may be dissolved in hot alcohol, and may be crystallized in this vehicle.

HEDERINE, A NEW ACTIVE PRINCIPLE.†

BY MM. VANDAMME AND CHEVALLIER.

In the seeds of the ground ivy there exists an alkaline matter for which the above chemists last year proposed the name of *hederine.*

This substance is exceedingly bitter, and it seemed to MM. V. and C. that it might be used with quinine or its sulphate, on account of its febrifuge property, in addition to the advantage of being indigenous, like salicine.

Hederine is found in the seed of the *hedera helix*, and seems to exist therein in the state of a per-malate. Its mode of separation is the same as that of other vegetable alkalies; it consists in treating the alkaline precipitate of hederine produced by hydrate of lime, by boiling alcohol, afterwards evaporating the liquor, &c.

ON BELLADONNINE.‡

BY M. P. LÜBEKIND.

M. Braudes has already shown by his experiments that the leaves of the *atropa belladonna* contain two new organic bases; one of which is solid and crystallizable, the other volatile, having a great analogy to ammonia. M. Braudes had there rested from his work, when M. Lübekind resumed it under the direction of Professor Löwig. He took 36 pounds of the dried leaves of belladonna, which he distilled in a tin alembic, with 12 quarts of caustic potassa, adding chloride of platinum, drop by drop, to the product of this distillation;§ instead of a powder in grains, crystallizable and octohedral, a white, uncrystallized precipitate was obtained, which was readily soluble in ammonia. This white precipitate was mixed with two parts of pure and dry carbonate of potassa; this mixture is introduced into a retort, and gently heated. It suddenly acquires a blackish color, and carbonic acid is disengaged, while, in the upper part and neck of the retort, a white substance is sublimed: this is pure belladonnine. In the gas which was disengaged, hydro-chloric acid was perceptible, only to smell, although no chloride was found in the sublimed matter, even when exposed for some hours in a place heated to from 35° to 40 Cels.

Belladonnine occurs in colorless, transparent crystals. A great number of experiments showed M. Lübekind that it does not contain sulphur. Burnt with a mixture of potassa and nitrate of potassa, it disengages a gas of a very pungent odour, which did not exert any action on nitrate of silver, which distinguished it from ammonia; that alkali producing, with nitrate of silver, a yellow precipitate, resoluble in the precipitant.

Belladonnine has a very great resemblance in its smell to volatile alkali. It is not very poisonous: taken fasting, in the dose of two grains and a half, it caused only a burning in the throat, which disappeared after breakfast. This alkaloïd entirely dissolves in water, and then exerts an alkaline reaction, which is not stopped by heat, as with ammonia: it neutralises the acids, and forms a series of salts. The analysis of this substance, made by means of Mitscherlich's apparatus, gives carbon, nitrogen, hydrogen, and oxygen, the proportions of which will be made known at a future opportunity.

Löwig looks upon this base as being formed of two compound bodies: this opinion is founded on the fact of its being decomposed by nitric acid, with a swelling up, owing to the great liberation of carbonic acid. In all the experiments to which it has been submitted, it appears to contain nitric acid. If this substance be heated, it fuses, with a disengagement of ammonia and nitrogen; there remains a white residue which is difficultly volatalised in yellow crystals, and an odour resembling that of cyanogen is perceived; by treating it with hydrate of lime, there is no ammonia given off. Hydro-chloric acid exerts a similar action on it, which gives rise to another yellow substance which crystallizes in rhomboids: it has an acid taste, and burns with a flame, when melted in a glass tube. A solution of nitrate of silver did not produce any precipitate in this singular combination. Neither lime nor potassa developed ammonia in it; the strong odour of that gas was not perceived when this substance was melted with caustic ammonia.

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* *Comptes Rendus*, No. 11, September 14, 1840.

† *Journal de Chimie Médicale*, October, 1840.

‡ *Dall' Archiv. der Pharmacie.*

§ *Annuavio delle scienze chimiche pharmaceutiche.*

VEGETABLE CHEMISTRY.—EXTRACTION OF THE YELLOW COLOR OF THE CALENDULA OFFICINALIS (GARDEN MARYGOLD).

To the Editors of The Chemist.

Gentlemen,—It would be a very desirable thing to many of your readers if vegetable chemistry more frequently adorned your pages; for this is a department of science in which interesting experiments are easily made; indeed, it can never be known what good would accrue to medicine, domestic use, and the arts, if the hidden treasures of the vegetable kingdom were properly investigated and brought to light. Such investigations can never be accomplished by analytical chemistry, by which method the elementary constituents of vegetables are found out at the cost of their destruction; for by this destructive process, every vegetable may be reduced to the same elements, though differing in their combination. It is very probable that the atomic system (though in its own place it is the perfection of chemical knowledge), yet it will never teach us *a priori*, the effect of any combination of elements; but if it did that we could at once tell what to expect from every substance after it is once perfectly analyzed; but such is the obscurity that hangs over all the operations of nature, that we can only account for effects by experience.

A few weeks back I took some of the petals of the *calendula officinalis*, or garden marygold, for the purpose of trying what would extract their yellow color; but experiments proved to me that neither water nor spirit of wine would; however, I have found that oil of turpentine will readily do so.

Little experiments of this description ought to teach us the importance of Lord Bacon's method of induction, when contrasted with the Aristotelian mode of idle reasoning. What a wide field presents itself in the province of natural history for the lover of truth to exercise his talents and his spare time.

I am,
Gentlemen,
Your obedient Servant,
Corvenius.

Corwen, North Wales,
Nov. 10, 1840.

THE IRISCOPE.*

BY DR. READE.

Dr. Reade exhibited an experiment, with an instrument which he called an Iriscope. A piece of black polished glass was rubbed over in part with a solution of Castile soap: as soon as it was dry, the soap was polished off with a glove, until, as far as appearances were concerned, the one part of the glass was as clean as the other. He then blew his breath on the plate through a tube about half an inch in bore, and instantly the most vivid rings of colours (resembling Nobili's) were exhibited where the breath condensed on the part of the glass which had been previously soaped; while, on the other part, the condensed breath exhibited simply the usual dead grey colour.

CONSTITUTION AND PRODUCTS OF THE DISTILLATION OF FAT BODIES.†

BY PROF. REDTENBACHER AND DR. VARRENTRAPP.

The object of this paper was to show that the composition of the fat acids has hitherto been erroneously stated. A variety of acids were subjected to examination, such as stearic, margaric, oleic, and sebacic acid. Margaric and stearic acids were shown to possess the same radical,—the former being the higher, the latter the lower oxide of it. This radical has the formula of $C_{34}\ H_{33}$, and may be represented by the symbol $\overline{Ma}$: thus stearic acid is $2\ \overline{Ma}+5\ O$; whilst margaric acid is $1\ \overline{Ma}+3\ O$. They thus resemble sulphuric and hyposulphuric acids. Margaric acid is one of the products of the distillation of stearic acid; the oxidation of the latter also causes the formation of the former. Oleic acid was analyzed by these gentlemen, having been obtained in a pure state. The results were principally numerical, and are stated in Liebig's Journal for last July or August, to which we refer for further details regarding this communication.

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* *British Association.*

† Read to the Chemical section of the British Association for the advancement of Science.

FRENCH MEASURES OF WEIGHT AND CAPACITY.

COMPUTED BY DR. URE.

At the request of several correspondents, we give the following table, from Dr. Ure's Dictionary :—

I.—MEASURES OF WEIGHT.

		English Grains.		Avoirdupois.
				Pound.
Milligramme	=	·0154		
Centigramme	=	·1543		
Decigramme	=	1·5433		
Gramme	=	15·4330		
Decagramme	=	154·3300	=	0·022
Hecatogramme	=	1543·3300	=	0·220
Kilogramme	=	15433·0000	=	2·204
Myriogramme	=	154330·0000	=	22·047

II.—MEASURES OF CAPACITY.

The cubic inch contains 252·5 *imperial grains of water at* 62°.

		Cubic Inches.		Imperial.	
				Gallons.	Pints.
Millilitre	=	0·06112			
Centilitre	=	0·61120			
Decilitre	=	6·11208			
Litre	=	61·12079	=	0	1·76377
Decalitre	=	611·20792	=	2	1·4464
Hecatolitre	=	6112·07920	=	22	0·2640
Kilolitre	=	61120·79208	=	220·47	
Myriolitre	=	611207·92080	=	2204·71	

II. CHEMICAL MANUFACTURES.

ON A NEW METHOD OF PHOTOGENIC DRAWING.*

BY DR. SCHÄFHAEUTL.

After some observations on the comparatively low value of all drawings taken by means of the camera-obscura, in an artistical point of view, and on the principal points on which Mr. Talbot's and M. Daguerre's methods of fixing the drawings of the camera-obscura were founded, Dr. Schäfhaeutl proceeded to describe his peculiar methods of producing photogenic drawings in Mr. Talbot's, that is, in a negative way; he then described two new methods of obtaining photographs in a *positive* way.

His first method tended to obtain a paper of very great sensibility by a comparatively short process. He recommended Penny's improved patent metallic paper, and spreading a concentrated solution of the nitrate of silver (140 grains to 2½ drachms of fused nitrate to 6 fluid drachms of distilled water), by merely drawing the paper over the surface of the solution contained in a large dish. To convert this nitrate of silver into a chloride, he exposed it to the vapors of boiling hydro-chloric acid. A coating of chloride of silver, shining with a peculiar silky lustre, was by this method generated on the surface of the paper, without penetrating into its mass; and in order to give to this coating of chloride of silver the highest degree of sensibility, it was dried, and then drawn over the surface of the solution of the nitrate of silver again. After having been dried, the paper was ready for use; and no repetition of this treatment was able to improve its sensitiveness.

The author's process for definitively fixing the drawing was as follows :—

He steeped the drawing from five to ten minutes in alcohol, and, after removing all superfluous moisture by means of blotting-paper, and drying it gently before the fire, the paper thus prepared is finally drawn through diluted muriatic acid, mixed with a few drops of an acid nitrate of mercury.

The addition of the nitrate of mercury requires great caution, and its proper action must be first tried on paper slips, upon which have been produced different tints and shadows by exposure to light; because, if added in too great a quantity, the lightest shades entirely disappear. The paper, after having been drawn through the above-mentioned solution, is well washed in water, and then dried at about 158° Fahr., or, in fact, till the white places of the paper assume a very slight tinge of yellow. The appearance of this tint indicates that the drawing is fixed permanently.

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* *British Association.*

Dr. Schäfhaeutl's mode of reversing the drawing is, in the principal points, the same as that suggested by Mr. Talbot. In order to obtain a photogenic drawing in a direct or positive way, he uses his above-mentioned paper, allows it to darken in a bright sunlight, and macerates it for at least half an hour in a liquid, which is prepared by mixing *one part* of the already described acid solution of nitrate of mercury, with from nine to ten parts of alcohol. A bright lemon-yellow precipitate, of basic hyponitrate of the protoxide of mercury falls, and the clear liquor is preserved for use. The macerated paper is removed from the alcoholic solution, and quickly drawn over the surface of dilute hydrochloric acid (1 part strong acid to 7 or 10 of water), then quickly washed in water, and slightly and carefully dried in a heat not exceeding 212° of Fahr.

The paper is in this state ready for being bleached by the rays of the sun; and in order to fix the drawing obtained, nothing more is required than to steep the paper a few minutes in alcohol, which dissolves the free bi-chloride of mercury. The maceration must not be continued too long, as in that case the paper begins to darken again.

The second method of producing positive photogenic drawings was by using metallic plates, and covering them with a layer of hydruret of carbon, prepared by dissolving pitch in alcohol, and collecting the residuum on a filter. This, when well washed, is spread as equally as possible over a heated even metallic plate of copper. The plate is then carbonized in a close box of cast iron, and, after cooling, passed betwixt two polished steel rollers, resembling a common copper-plate printing-press. The plate, after this process, is dipped into the above-mentioned solution of the nitrate of silver, and instantly exposed to the action of the camera. The silver is, by the action of the rays of the sun, reduced into a perfect metallic state, and the lights expressed by the different density of the milk-white deadened silver, the shadows by the black carbonized plate. In a few seconds, the picture is finished; and the plate is so sensitive, that the reduction of the silver begins even by the light of a candle.

For fixing the image, nothing else is required, except dipping the plate in alcohol mixed with a small quantity of the hyposulphite of soda, or of pure ammonia.

PROCESS OF BLEACHING COTTON.*

There is at present a mode of bleaching cotton, which is done purely by steam. It consists in steeping the cloths in an alkaline ley. They are placed, when thus steeped, in a tub with a double bottom; the first bottom on which the cotton goods rest is pierced with holes. Below this tub is placed a boiler, in which water is heated to the boiling point. The steam having no other escape, is obliged to pass through the cotton goods. At first it is condensed. After a little time the cloths become hot, and the steam does not pass through them until it has heated the whole quantity to the boiling heat. It will be perceived, that by this means the dirty water never comes in contact with the cotton fabric, as the water distilled by boiling alone touches them.

This method, which is attended with many inconveniences, has not yet, that we know of, been adopted, excepting for the washing of domestic linen, and it has not even in that respect been much used. In some bleaching yards, the heating of the goods to be cleansed is effected directly by boiling in the ley. For this purpose, the boiler is in the form of a long vertical cylinder, of the same height as the tubs which it is to supply, and near to which it is placed. It communicates with each one by two horizontal tubes, fitted with stop-cocks; one of which tubes is fixed at the bottom, and the other some centimetres below the upper part of the boiler. When the tube is filled with cottons, the alkaline liquor is poured on them until they are covered by the ley. It is evident from this arrangement, that the boiler will be filled to the same level as the tubs. When the fire is lighted under the boiler, the heated portions of the liquid near the bottom rise to the top by their diminished specific gravity, and the liquid rises higher in the boiler than it is in the tub; but it then begins to flow immediately into the tub by the upper tube, and its place is supplied by the colder ley, which passes from the tub to the boiler, by the lower tube. It is in this manner that a circulation of the liquid is kept up until all the liquid mass has arrived at boiling heat. This method has the great advantage of not being attended with any danger, but it requires a much greater quantity of the alkaline liquor than the other. This is the cause of its use not having been more frequent.

When the chlorine is employed, the cloths should be dipped in a very weak solution of the chloride of lime. They should not remain any length of time in the chloride bath; but should be steeped only for a few minutes, and then taken out, otherwise it might happen that some pieces of the chloride of lime might be deposited on the cloth, and make holes.

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* *Moniteur Industriel*, and *Inventor's Advocate.*

The action of the acids, which are employed immediately after the chloride of lime, is intended to decompose the chlorine on the cloth; by which means the chlorine in a state of gas attacks the coloring matter with all its energy. This produces sulphate of lime, which is removed by the subsequent rinsings. These processes require the greatest care, otherwise if any of the acid liquor remained on the cloth, it would destroy its fabric.

The foregoing is the mode of bleaching which was generally pursued, until the new process was introduced by Messrs. Price and Dunn, chemists and bleachers, near Boston, in the United States. Those gentlemen communicated, in 1837, to the Society of Manufactures at Mülhausen, that they had succeeded, and without a single failure, in removing grease marks by a ley of chalk; but, instead of using caustic soda in the subsequent operations, they used only carbonate of soda, or carbonate of potash. The Society at Mülhausen proceeded to test the experiment, and it was found that the process indicated by Messrs. Price and Dunn fully answered.

This is what takes place in the course of the operation:—The ley of lime converts the greasy matter into a chalk soap; and in the subsequent washing, the carbonate of soda or potash, by means of double decomposition, makes a soap of soluble potash or soda, and of the insoluble carbonate of lime, which has no affinity for the cotton.

M. A. Scheurer, who was employed by the Society at Mülhausen to examine and make a report on this method of bleaching, thus describes the different processes:—

A piece of cloth was sent to me to bleach, which had been woven a long time, and was covered with grease marks produced in the weaving; there had also been purposely made on it some stains of a drying oil, well dried in with heat; and new stains of tallow were fixed on it, by passing a heated iron over it to burn it well into the cloth. I first soaked it for four hours in a hot thick ley. Next, in lukewarm acid for half an hour. Then in a lukewarm ley of soda, for four hours. Fifth, in an acid solution. The cloth treated in this manner had all the marks of grease removed, but it was not sufficiently white. I then steeped it in a weak mixture of chloride of lime and acid; in a ley of carbonate of soda for four hours; and again in a mixture of chloride of lime and acid. The cloth was by these means rendered beautifully white. It is desirable to steep the cloth in an acid after having been in the lime ley, as the acid removes the excess of lime from the calcareous soap which is formed. It must not be either too strong or too hot; as nearly cold as possible is the best, and the cloth should be soaked for more than four hours. For this purpose, muriatic acid is preferable to sulphuric.

Most of the bleachers in Alsace, and many other countries, have adopted this process. In a report to the Mülhausen Society, dated the 18th December, 1839, M. E. Schwartz insists on the necessity of steeping the cloth in an acid ley, immediately after the ley of lime; because, he says, that at present the decomposition of the calcareous soap on the cloth by carbonate of soda is not required, but rather the complete decomposition of this calcareous soap by an acid, thus to detach the greasy matter, which in this state is more easily soluble by the carbonates of the alkalis, than by alkalis in their caustic state.

METHOD OF EXAMINING STEEL, BAR IRON AND CAST IRON.*

BY M. BERZELIUS.

The iron is reduced to filings as fine as possible, because the operation is much quicker when the metal is very finely divided.

The iron is afterwards digested in a solution of chloride of copper, in sufficient quantity to convert it into chloride of iron. This takes place in twenty-four hours, at a temperature of 50° C., if the iron is not in too large pieces. It is easy to ascertain, by means of a glass rod, if any undissolved pieces remain. The liquor is separated and filtered in the apparatus described farther on. Fresh concentrated chloride of copper, to which hydrochloric acid has been added, is poured on the residue, which is formed of copper mixed with carbon; the whole is digested until the copper is dissolved in the state of chloride. The carbon remaining must not be separated with paper. The separation is made with the following apparatus:—

In the bottom of a tube terminating in a point, is put a compressed mass of asbestos, previously boiled in hydro-chloric acid, and afterwards heated to redness. Instead of asbestos, spongy platinum may be used, but is not so well to be depended on. The solution is to be filtered through this mass, and the remaining chloride is removed with hydro-chloric acid; it is then washed with water. If the operation do not require any great accuracy, the residue may be dried in a current of air which has passed through a tube filled with chloride of calcium, while the mass is heated to about 130° C., in a suitable bath.

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* *Poggendorff's Annalen*, vol. xlvi. page 42.

If the weight of the tube and of the asbestos be known by weighing the tube, that of the residue may be obtained. As much of it as can be disengaged from the asbestos is then weighed, and burned with charcoal; the residue is analysed.

But this method, in order to determine the carbon, is never quite accurate, because, in the first place, this mass, when heated in the tube, always gives, whether in the air or in oxygen, products resulting from the distillation of organic substances, which show that when the carbon is separated from the iron with which it is chemically combined, a combination of carbon and hydrogen, perhaps also of oxygen, is formed; and, in the second place, because the carbon condenses in its pores air and water, with such energy, that it becomes heated on being put in contact with the air, after being dried *in vacuo*.

On these accounts, it is better to remove the charcoal with asbestos, to mix the whole, first with chlorate of potassa, then with thirty, forty, or fifty times its weight of oxide of copper, and to determine the proportion of charcoal, as would be done in an organic analysis.

In the same tube in which the residue of the steel or bar iron has been filtered, it is burned in a slow current of oxygen collected over mercury; the carbonic acid is extracted by means of hydrate of potassa. By this method, it has been found that iron, prepared by the "*puddelage*" process, contains only $\frac{1}{10}$ of the quantity of carbon contained in the bar iron prepared according to the ordinary method.

In order to ascertain the other foreign matters contained in iron, the following method is made use of:—

A bottle for disengaging gas is taken, the neck of which is hermetically closed by a conical glass tube, in its turn closed by a glass stopper; a second tubulure, at the side and near the top of the bottle, receives a disengagement tube. In this bottle iron is dissolved in dilute hydro-chloric acid: ten grammes of the metal must be operated on, and often more: the gas is driven into a tube containing a rather weak solution of caustic ammonia, mixed with nitrate of silver. In order to prevent small portions of the liquid from following the gas, a small quantity of cotton is stuffed into the middle of the disengagement tube. During the disengagement of the gas, which should be carried on slowly, the ammoniacal solution of silver absorbs the sulphur, arsenic and phosphorus. The solution is then slowly continued for several days. In this operation there is always obtained a small precipitate of silver which, when the iron is perfectly pure, it would seem, can be only carburet of silver. The dry way with saltpetre is the best method of treating the precipitate obtained in the solution of silver: the sulphuric, arsenic, and phosphoric acids are afterwards separated by the ordinary methods.

The solution contained in the bottle is separated by filtration from the undissolved portion, and the latter is examined to see if it contain arsenic, ranadium, and magnesia, either by treating it with nitro-muriatic acid, or by carefully oxidising it in the dry way, by means of saltpetre and carbonate of soda, after which the silica must be separated.

The solution is afterwards oxidized by means of nitric acid; or a better way is to saturate it with chlorine, and precipitate the oxide of iron by a slight excess of pure carbonate of lead. The solution is filtered, the precipitate is washed, and the liquid is evaporated to siccity in a sand-bath and treated with alcohol at 0·84, which leaves chloride of lead; it is then examined whether the alcoholic solution contains lime, potassa, manganese, or any other substance. The chloride of lead may be decomposed by means of sulphuretted hydrogen, and the liquid may be examined.

The precipitate obtained by means of carbonate of lead is to be treated in the dry way, by carbonate of potassa and soda; it is afterwards examined as to whether the alkali procured from it contains alumina, phosphoric acid, arsenic, or any other substances.

In this way, it will be difficult for any substance to escape notice.

NEW PROCESS OF ZINCING COPPER AND IRON.*

The German chemist Boettiger, in making some attempts to give to sheets of copper, by means of solvents, the appearance of pinchbeck or brass, as is done in the manufacture of mosaic gold by means of the vapors of zinc, has discovered a simple and economical means of covering with a brilliant coating of that metal all kinds of articles of copper manufacture, which may be useful for various purposes. It may be supposed from the effect produced in the voltaic pile on the discs of copper and zinc by pasteboard soaked in a solution of sal ammoniac, that that salt is the best agent to cover any metallic substance with a coating of zinc.

To perform the operation, granulated zinc (obtained by pouring the melted metal into a hot iron mortar, and stirring it rapidly with the pestle till it becomes solid) is placed in a porcelain capsule, or any other non-metallic vessel ; a saturated solution of sal ammoniac is poured upon it, and heated to the boiling point. The articles to be covered with zinc are then put in, after having been previously well cleaned with a weak mixture of hydro-chloric acid, and in a few minutes they are covered with a brilliant coating of zinc, which adheres with great tenacity, and cannot be removed by common friction. Iron and steel may be plated with zinc in the same manner, after having first coated them with copper by placing the articles in a solution of sulphate of copper.

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* *Inventors' Advocate.*

CASTING BY GALVANISM.*

In a leaden vessel, furnished with an external case to hold the chemical agents, is placed a bag formed of raw hide or parchment, enclosing a cylinder of zinc immersed in sulphuric acid diluted with water. This forms the voltaic battery. In a trough placed near the battery, is put the solution of sulphate of copper dissolved in sulphuric acid, and the model, either hollow or in relief, of which it is intended to produce a fac-simile in copper. The communication is made by means of a strip of lead, and the model being previously covered over with a metallic preparation or film, is thus brought into connection with the leaden vessel, and with sheets of copper which surround and cover over the model, and which communicate also with the cylinder of zinc. The operation then begins, and ought to be conducted with slowness and regularity; observing to keep the liquids always at the same degree of strength and action, which can be measured by the galvanometer. If the operation be too rapid, the surface of the cast is rough and streaked; the metallic atoms are unequally deposited, disturb the accuracy of the forms, and produce the effect of grains of sand. After the operation, the crust of copper which covers, or is inside the model, is brittle. To render it malleable, it is only necessary to expose it to a certain degree of heat. This heat at the same time destroys the models if they be in relief, and there remains only the external crust of copper; the suppleness of which may be increased to any extent by heat.

When the model is not metallic, it is requisite to submit it to a preparation that will make it capable of attracting the molecules of the copper contained in the solution of sulphate of copper. If it be a plaster model, it is covered with an impalpable copper powder by means of a fine brush. If it be a vegetable, it is steeped in a resinous oil, and it is then covered with the copper powder. Without this precaution, the operation would not succeed ; and all the places where the copper dust does not adhere, will not receive the metal deposited by the galvanic action. There will, consequently, be holes in those places.

These directions comprise the principal parts of the process adopted by M. Soyer. When any part is omitted, or not carefully attended to, the streaks, inequalities, and alterations of form are produced, which were frequent in the first attempts to pursue this process. At present, all these defects and difficulties have been removed, and the whole face of the bust of young Hercules, presented, on the 17th of August, to the Academy of Sciences at Paris, is completely devoid of the least imperfection. In the hair alone is there any trace of the sand-like appearance, which arises from the rapidity with which it was necessary to complete the operation in order to have the bust finished before the meeting of the society.

The opening which the galvanoplastic process affords to future applications of the principle in the arts, seems to be immense. Even as at present known, the process presents so much certainty, and such advantages in point of economy, that M. Soyer has not hesitated to make an offer to the municipal council of Paris, to execute for 200,000 francs, a cast of the colossal elephant of the Bastile, which, in the ordinary mode of casting, would not cost less than 600,000 francs. The process will prove still more economical when applied to produce ordinary statues and public monuments, which need not be more than one-third their present thickness of metal.

The makers of artificial flowers, the manufacturers of copper instruments, goldsmiths and jewellers, may also derive great advantages from the galvanoplastic process, for it is not confined to copper alone, but may be extended to silver, gold, or platinum. By this means, any object in nature may be made into a model on which a casting in metal can be made as perfect in form as the natural prototype. There seem scarcely any limits, indeed, to which this process may not be extended in reproducing, in a solid metallic form, castings of every kind, and from any pattern, whether of natural or artificial objects.

TO DEPOSIT SOLID VOLTAIC PLATES, HAVING THE LINES IN RELIEF.*

Take a plate of copper, lead, silver, type-metal, or any metallic substance, of the required size, and engrave on it to the depth requisite to print from when in relief; then solder it to a piece of copper wire. Contrary to ordinary engraving, the lines must be flat at the bottom, and as nearly as possible of the same depth. When so engraved, heat the copper plate, and apply wax to the plate, in the manner already mentioned, to prevent the voltaic copper from adhering.

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* *Inventor's Advocate.*

* *Spencer's Instructions for the Multiplication of Works of Art in Metal.*

The plate must now receive a couple of coats of varnish on the backs and edges, the varnish consisting of a preparation of shelllac and alcohol, or of melted bees' wax. Care must be taken to keep the engraved surface of the plate clean.

It is now ready to be placed in the apparatus, to be deposited on.

Should the plate be lead, or, what is still better, type-metal, the wax does not require to be applied, in the first instance, to the front of the plate, as, when it is deposited on to the given thickness, the application of heat is alone sufficient to loosen the plates.

I do not anticipate that this method of procedure will ever prove very generally useful, although, in some instances, I can believe it may be advantageous to adopt it. Where strong outlines are required to print along with matter set up in type, it may be economical, as in geometrical figures, or those of crystals, &c.

Lines in wood engravings are *left standing*, all the surrounding matter to be *cut away*, necessarily entailing much labour; but by this method, all the lines that are required ultimately to be in relief, would have to be sunk in the plate of soft metal, a process that would require little more time to perform than drawing them.

The tools to cut the metal should be formed with flat faces, and with a guage to indicate when they had arrived at the proper depth.

The engraving necessary for a whole work on geometry, for instance, or where diagrams are requisite, might be so cut in one single sheet or plate of type-metal, the letters or figures of reference being punched in, and the whole deposited on *at once*.

When deposited to a sufficient thickness, the voltaic plate, having the lines and letters in relief, might then be separated into the requisite number of pieces, and each mounted with roman cement moistened with drying oil, on small blocks of wood, to bring them up to the level of type.

Should any of the lines rise above the others, they may be smoothed down by rubbing the face of the block on a *smooth* flag with a little water, and the lines, if necessary, could now be retouched with the graver. To a small extent I have seen this plan adopted with perfect success.

ANOTHER METHOD.

I have occasionally tried another method, which, in the hands of a practical engraver, might be useful. Take a copper or brass plate, and give it a coating of fine plaster of Paris or other substance. When dry, let the surface of the plaster be rubbed down level, until there is as much thickness left as the lines are required to be in relief to print from. It must now be smoked with the flame of a lamp, and the lines drawn in the surface thus prepared. The brass or copper plate will prevent the point used from going deeper than is necessary, consequently, the lines will be all of the same depth. When the engraving is completed, let the plaster surface be metallized with the nitrate of silver and the phosphoric solution, as already described. This done, a plate of solid copper may be deposited on its surface, all the lines being perfectly level.

TO RAISE LINES IN RELIEF ON A PLATE OF COPPER OR OTHER METAL.*

Take a plate of copper, or any other metal. It is not essential that it should be highly polished.

Have a piece of copper wire neatly soldered to the back part of it, then give it a coating with a camel hair brush of either of the cements just mentioned. This is best done by heating the plate as well as the wax; or, to level the wax after it has had a coat, hold the back part of the plate over a charcoal fire or a spirit lamp,—taking care to have it level.

Then write or draw the design on the wax or cement with a point. The wax must now be cut through with a graver or steel point, taking special care that the copper *is exposed in every line.*

It must now be immersed in dilute nitric acid, say three parts of water to one of acid. It will at once be seen whether it is strong enough, by the green color of the solution, and the bubbles of nitrous gas eliminated. Let it remain long enough to allow the exposed lines on the plate to be *slightly* corroded, that the wax, which gets into the pores of the copper during the heating process, may be thoroughly got rid of. Practice will determine this better than any rules.

The plate is now ready to be placed in the voltaic apparatus. After the voltaic copper has been deposited on the lines engraved in the wax, the surface of the formation will be found to be more or less rough, according to the quickness of the action. To remedy this, rub the surface with a piece of smooth flag or pumice stone, with water. Then heat the plate, and wash off the wax groundwork with spirits of turpentine and a brush.

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* *Spencer's Instructions for the Multiplication of Works of Art in Metal.*

A card plate, having the lines in relief on this plan, was procured by me more than two years ago; a few copies were printed from it, but they were coarse.

CHEMICAL BRONZE.

To the Editors.

Gentlemen,—I take the liberty of replying to a request of one of your correspondents to be informed of the method of bronzing metals:* it is as follows:—

Mix 62 grains of muriate of ammonia, 15·5 grains of oxalic acid in a pint of good vinegar,—after having well cleaned the metal to be bronzed, rub it over with a brush dipped in this solution, taking only a very small quantity at a time; when it is dried by rubbing, take some more, and continue so doing till the metal has acquired the tint required.

To render the proceeding more expeditious, it may be performed in the sun or on a heated stove. This will give different objects the appearance which distinguishes the ancient bronzes.

I am, Gentlemen,
Your Obedient Servant.
J. R. S.

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* *The Chemist*, No. VII. page 224.

III. PHARMACY, &c.

MR. HAWES' MEDICAL REFORM BILL.

We have much pleasure in being enabled to lay before our readers an abstract of this bill; it is entitled:—

A Bill to Amend the Laws relating to the Medical Profession in Great Britain and Ireland.

I. *Preamble.*—Whereas it would tend to the advantage of the public to alter and amend the laws touching the medical profession, and to make due provision for the prevention of persons not being duly qualified from practising the art of medicine, and to provide that persons, before practising the same, shall be duly examined as to their skill and knowledge, by learned and competent persons, and thereupon be permitted to follow and exercise the Art of Medicine in any part of the British dominions.

II. *Interpretation Clause.*—Be it therefore enacted, That in this act, the words "Art of Medicine" be construed to include within their meaning the recommending, prescribing or ordering, either directly or indirectly, any medicine, remedy or application whatsoever, for the relief or cure of any disorder, ailment or illness of the body or mind, or any part thereof, or performing any surgical operation, minor or capital, or practising midwifery; and the words "Medical Practitioner" shall mean a person qualified under this act to practise the Art of Medicine; and that the words "Chemist and Druggist" shall mean a person who shall sell, deal in, mix, or dispense for sale, any drug or medicine for the cure or relief of any bodily disorder, ailment or illness, excepting such persons as shall have obtained a certificate to practise the Art of Medicine; and the word "England" shall include Wales.

III. *Registrars of Medical Practitioners.*—And be it enacted, That within three months from the passing of this Act, the Secretary of State shall appoint three persons to be registrars,—one for England, another for Scotland, and another for Ireland; each of these registrars to have his office in the metropolis of the country for which he is appointed to act: and the Secretary of State shall also appoint such clerks and other officers as he shall deem necessary for assisting in carrying this act into execution, until the election of the first councils, as hereinafter provided: Secretary of State to have the power of removing any person so appointed. Before the election of such councils, all reasonable and necessary expences of carrying this Act into execution, to be paid by the Lords of the Treasury out of any monies received by the said registrars by virtue of this act.

IV. *Persons at present legally qualified to practise Medicine or Surgery.*—And be it enacted, That the said registrars shall, within thirty days of their appointment, distribute certificates to practise the Art of Medicine, according to the form ordered by this Act, to every person applying for the same, and producing his diploma, certificate or license to practise Medicine or Surgery, dated prior to the passing of this Act, granted by any English, Scotch, or Irish University, College, Hall, or other person or corporation, legally entitled to grant the same at the time of the passing of this Act, and also to every person who shall apply for the same, and who was actually practising Medicine in England prior to August 1st, 1815; registrars to grant certificates to practise Medicine, or licenses to carry on the trade and business of a Chemist and Druggist, only for that part of the United Kingdom for which they shall severally be appointed to act.*

V. *Payment for Certificate.*—And be it enacted, That every person applying for a certificate to practise Medicine, shall pay for it to the registrar, the sum of [ ], and shall be subject to the like payment annually. The certificate shall bear date from the day on which it is granted, and shall continue in force until Feb. 1, 1843; and the registrars shall, at any time within one month before Feb. 1, in each year, grant such certificates to any persons entitled to them, taking effect from their date, and remaining in force until February 1, in the year following; and each registrar shall enter in a book every certificate he grants, and shall print a correct alphabetical list of all persons to whom he has granted such certificates for the ensuing year; and those persons only whose names are contained in the last printed medical lists shall be entitled to vote at any election held for the purposes of this Act: these lists shall be furnished by the respective registrar to every person who shall apply for the same, on payment of 6*d*. for each copy.

VI. *Council.*—And be it enacted, That on the first day of June, 1842, the medical practitioners residing in England, and registered under this Act, shall elect a council for England; those in Scotland, for Scotland; and those in Ireland, for Ireland: each council to consist of twenty, who shall go out every three years; each councillor shall be eligible to be re-elected.

VII. *Candidates for Council to be Nominated.*—And be it enacted, That forty days previous to the day of each election, any voter, duly qualified as above, may give or transmit to the registrar a paper according to the form prescribed by this Act, signed by not less than six voters, containing the names of persons whom he considers fit to be elected as councillors, and the registrar shall print a list of all such persons (unless they be members then going out of office), together with names of the persons recommending them, in the voting papers to be used at the next election, persons so nominated alone shall be eligible to be elected.

VIII. *Place of Election.*—The elections are to be held at a place appointed by the respective councils; that for England, within four miles of the General Post Office, in London; those for Scotland and Ireland, within two miles of the Post-Offices in Edinburgh and Dublin respectively: notice of election to be given at least ten days before it takes place, by advertisement in the principal local paper: the first election of councillors shall be held at places appointed by the registrars.

IX. *Method of Voting at Elections for Council.*—Every election shall be held before the registrar, to commence at nine A. M., and finally close at four P.M. of the same day, and every voter may vote for the whole number of councillors to be chosen, by delivering in to the registrar or his deputy a paper, according to the form laid down in this Act, folded or sealed up, so that the contents cannot be seen, containing the names of the persons for whom he votes. This paper may be sent by post, and in that case must contain a declaration according to the form prescribed in this Act. The registrars shall transmit to every voter, a paper and a declaration as aforesaid, which shall be returned to the registrar filled up, to be opened on the day of election, according to the provisions hereinafter made.

X. *Result of Election, how to be declared.*—After the election the registrar shall examine the voting papers to ascertain who are elected, and the twenty persons who shall have the greatest number of votes shall be the councillors elected. In case of an equality in the number of votes for two or more persons, the registrar shall publicly draw by lot from among those having an equal number of votes, as many names as shall be necessary to complete the number of councillors to be elected; and the names of the council shall be published in the local newspapers having the largest circulation within seven days after such election; and each of the past councils shall, after the year 1842, appoint two or more councillors, to see that the said election has been fairly conducted, and to certify the same. At the elections for councils in 1842, the Secretary of State shall appoint two persons to superintend the election.

XI. *Medical Colleges and Corporations at present in Existence.*—The University of Oxford, in convocation assembled, and the Senates of the Universities of Cambridge and London, and the *Fellows* of the London College of Physicians, and the *Council* of the London College of Surgeons, and the Court of Assistants of the Apothecaries'

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* Want of space compels us to omit this form, together with many others prescribed under this Act.—EDS. CHEMIST.

Society in London, shall, if they think fit, severally appoint one fit person to be a member of the council for England; and the Faculties of Medicine in the Universities of Edinburgh, Glasgow, St. Andrew's, and Aberdeen, and the Councils of the Edinburgh Colleges of Physicians and Surgeons, and of the Glasgow Faculty of Physicians and Surgeons, shall, if they think fit, severally appoint one fit person to be a member of the council for Scotland; and the Provost and Fellows of Trinity College, Dublin, and the Councils of the King's and Queen's College of Physicians in Ireland, and the Dublin College of Surgeons, and the Dublin Court of Apothecaries' Hall, shall, if they think fit, severally appoint one fit person to be a member of the council for Ireland.

XII. *Future Registrars.*—On the occurrence of a vacancy in the office of registrar the several councils shall appoint another registrar; or, in case of their failing to do so, the Secretary of State shall appoint one.

XIII. *Council may remove Registrar.*—The council of each kingdom may remove a registrar for neglect, misconduct, or infirmity of body or mind; and in the event of the office being at any time vacant, such vacancy shall be advertised in the newspapers of the largest circulation within the kingdom for which he acted, six weeks previous to the day for electing a successor. Candidates to give notice of their intention to the council fourteen days previous to the election. If any registrar is absent or incapable for a time, the president of the council shall appoint a good deputy to act for him.

XIV. *Officers appointed under this Act.*—On the 14th of June in every year each council shall elect, by ballot, a president for one year; and if he die, or cease to hold the office, the council shall, within ten days, elect by ballot another for the remainder of the year; and shall also appoint a treasurer, not being a member of the council; and three auditors of the accounts of the council; and also their own clerks and other officers. The councils may remove any treasurer, auditor, clerk, officer, or servant so appointed, and appoint other persons to fill those offices when vacant; and shall fix the salaries of the registrar, treasurer, and others employed by them; and also such remuneration to the individual members of council for the execution of their duties as they shall deem reasonable.

XV. *Meetings and Voting of Councils.*—All acts of the council may be decided by the majority present; and the meeting must consist of a majority of the whole council. The president, if present, to have a casting vote. The meeting of council to be notified three days beforehand, by summons sent to the abode of each member.

XVI. In this clause provision is made for the holding of special meetings.

XVII. *Monies of Council.*—All monies, fees, and dues belonging to the council, shall be paid to the treasurer, to be by him carried to the account of a fund to be called "The Medical Fund," and to be applied towards the payment of all expenses incurred in carrying this Act into effect; and in case "The Medical Fund" shall be more than sufficient for these purposes, the surplus may be applied from time to time towards the encouragement and advancement of medicine, and of science and literature connected therewith, as the senate hereinafter mentioned, and council conjointly, shall think most desirable.

XVIII. *Payments.*—The treasurer shall pay no money out of the fund, except upon the order of three or more members of the council, countersigned by the registrar, except as hereinafter provided.

XIX. *Accounts.*—The treasurers' and registrars' accounts shall, in June and December in every year, be regularly audited and published, along with the current medical list.

XX. *The Councils when at Law.*—And be it enacted, That the councils may sue and be sued in the name of their registrar for the time being, who is to be deemed plaintiff or defendant in every such suit or action; but the registrar, although appearing as plaintiff or defendant on the record, may, if not otherwise interested or objectionable, be a witness in every such action.

XXI. *Election of Medical Senate.*—And be it enacted, That within thirty days next after their election in 1842, and in the December of every fifth succeeding year, each council shall elect from amongst themselves, or others, by ballot, three fit and proper persons, who shall be called "the Medical Senate of Great Britain and Ireland," and shall continue in office five years. Vacancies in the senate to be filled up by the councils for the remainder of the five years. Members of senate shall be capable of being re-elected.

XXII. *Registrar of the Senate.*—The registrar for England shall be the registrar to the senate.

XXIII. *Meetings of the Senate.*—The senate shall, on the 10th day of July in every year, meet in London, at the usual meeting place of the council for England; and all reasonable expenses of the members of the senate attending any such meeting shall be defrayed out of "The Medical Fund" of the respective councils. The rest of the clause makes provision for the holding of special meetings of the senate, at the desire of any two of the councils.

XXIV. A majority of the whole senate must be present, and assent to acts of the senate.

XXV. *President of Senate.*—At its annual meeting, the senate shall elect by ballot its own president for one year. A vacancy to be supplied in the same way for any portion of the twelve months.

XXVI. *Privileges of Senators.*—It shall be lawful for any member of the senate to be present at any meeting of the councils, and take part in its discussions, but not vote at these; and also to be present at any examinations held by any examiners appointed under this Act.

XXVII. *Expenses of Senate.*—All expenses of the senate (excepting the expenses of its members attending the same as herein-before provided) shall be divided into three equal portions; and the senate shall make an order, signed by three members, and countersigned by their registrar, for the payment of the one such portion upon each of the treasurers of the several councils, who shall pay the sums expressed in such orders out of any monies coming into their hands under this act.

XXVIII. *Bye-laws regulating Medical Education and Examinations for Diplomas.*—The Senate shall make such bye-laws for the United Kingdom, regulating in all respects the education of candidates applying to be examined for a diploma of qualification to practise medicine, or to carry on the trade and business of a chemist and druggist, and also regulating the examinations of persons prior to the granting of the said diploma, as from time to time shall seem proper to the said Senate; and such persons only as shall comply with such bye-laws shall be admitted to such examinations. And be it further enacted, that no such bye-law shall be of force until forty days after a copy thereof has been published in the *London Gazette*, and another copy thereof has been sent to the Secretary of State for the time being; and if at any time her Majesty, by and with the advice of her Privy Council, shall disallow such bye-laws, or any part thereof, such bye-laws, or the part thereof so disallowed, shall be null and void. If the Senate neglect to publish any such bye-laws within twelve months, the Secretary of State shall make and publish them: provided also, that any such bye-laws shall not be valid unless they require that previous to the final examination of any person desirous of obtaining a diploma of qualification to practise the art of medicine, he shall produce a diploma, certificate, or letters testimonial, of having taken a degree in medicine, or of having passed an examination in medicine or surgery before some university, college, hall, or other persons, legally entitled to grant a diploma, certificate, or letters testimonial, at the time of the passing of the Act.

XXIX. *Senate to publish a New Pharmacopœia.*—And be it enacted, That the Senate shall cause their registrar to publish, under their direction and authority, a book containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed, &c., to be called *The British Pharmacopœia;* and that the senate may alter and amend such Pharmacopœia as often as they deem necessary; and every chemist and druggist shall mix, make, and compound, according to the directions therein contained, and according to no other formulary, and obey in all respects the orders therein directed.

XXX. *No Person to practise Medicine, or carry on the Trade of Chemist and Druggist, unless qualified under this Act.*—And be it enacted. That no person whatsoever shall, from the 1st of Feb. 1842, practise medicine for remuneration or gain, directly or indirectly, in any part of the United Kingdom, unless he has obtained a certificate to practise the said art according to the provisions of this Act; nor shall any person from the 1st of December, 1842, carry on the business of a chemist and druggist in any part of the United Kingdom unless he has obtained a licence under this Act.

XXXI. *Present Licensing Bodies.*—After the publication of the bye-laws for regulating the examinations for diplomas to practise medicine, no corporations nor any university, except under this Act, shall grant a diploma, certificate, or licence to practise medicine, or to carry on the trade of a chemist and druggist in any part of Great Britain and Ireland.

XXXII. *Council to appoint Examiners annually.*—And be it enacted, That each of the councils shall appoint annually fit persons to be examiners for granting diplomas in medicine, or licences to carry on the business of a chemist and druggist; and such examiners shall examine as the senate shall direct, all candidates who may prove to be duly qualified according to the bye-laws of the senate, and report the result of the said examinations to their respective councils, who shall direct their registrar to grant a diploma to practise medicine, or carry on the trade of chemist and druggist according to the forms annexed, to every person whom the council shall deem qualified, upon the payment of the sum of [ ] for such diploma; and every person who shall have obtained such diploma may obtain from one of the registrars a certificate or licence to practise medicine, or trade as a chemist and druggist, and to renew it annually; and no person, except as herein provided, shall receive such a certificate or licence unless he pass such examinations aforesaid.

XXXIII. *Navy and Army Surgeons.*—Every person desirous of being appointed medical officer in Her Majesty's army or navy shall be eligible for such appointment upon obtaining a diploma of qualification, or a certificate to practise the art of medicine, and, while actually employed in Her Majesty's service, shall not be compelled to renew it annually.

XXXIV. Dentists or cuppers now in practice shall, before the 31st of December, 1842, send a declaration as prescribed under this Act, signed by themselves and two substantial householders, to the registrar, and shall obtain a certificate giving them leave to practise still what they practised before.

XXXV. *Licence to carry on the Trade of a Chemist and Druggist.*—And be it enacted, That each registrar shall grant a licence to carry on the business of chemist and druggist, according to the form annexed, to every person who has received a diploma of qualification from either of the councils, upon the payment of the sum of [ ] for such licence, to be renewed annually, on the 30th day of November; and each registrar shall register every licence which he grants as aforesaid, and publish the same in his medical list; and also the registrar shall grant the same to persons already, before the passing of this Act, carrying on the trade of chemist and druggist, or persons being assistants or apprentices, and applying within twelve months to the registrar for the same, and these persons are not to renew it annually unless they desire: provided always, that if any person as aforesaid shall once renew his licence as aforesaid, it shall not be lawful for him to carry on the trade and business of chemist and druggist unless he continue to renew it annually.

Licence to carry on the Trade and Business of Chemist and Druggist.

I, A. B., by virtue of the powers vested in me by an Act of Parliament passed in the year of the reign of Her Majesty Queen Victoria, authorize C. D. of to carry on the trade and business of a chemist and druggist in that part of the United Kingdom of Great Britain and Ireland called until the 31st day of November, 18

Dated and signed by the medical registrar.

Licence to carry on the Trade and Business of a Chemist and Druggist.

I, A. B., by virtue of the power vested in me by an Act of Parliament, passed in the year of the reign of Her Majesty Queen Victoria, hereby authorize C. D., of to carry on the trade and business of a chemist and druggist, he having signed a declaration that he was engaged in the said business previous to the passing of the said Act.

Dated and signed by the medical registrar.

Declaration of Chemists and Druggists.

To the medical registrar for
I, A. B., of hereby declare that I was previous to the day of 18 at
Dated and signed .

XXXVI. *Medical and Chemical Assistants and Apprentices.*—And be it enacted, That every medical practitioner, and every chemist and druggist, having any assistant or apprentice in his employ shall, before the 31st of December in every year, transmit to the registrar the name of such assistant or apprentice, according to the form annexed, together with a declaration in writing, signed by himself, according to the said form; and the registrar is required to register in a book the names of the persons so transmitted to him, and insert them in the medical list published next after the receipt of such declarations; and be it enacted, that no medical practitioner shall, after the 31st day of December, 1842, employ any person as an assistant who does not possess a diploma of qualification, or a certificate to practise the art of medicine; and no chemist and druggist shall employ any person to assist him in the actual vending of drugs and medicines who does not possess a diploma of qualification to carry on the trade and business of a chemist and druggist, or a licence according to the form above, unless such persons so being assistants to any medical practitioner or chemist and druggist shall be apprentices for any period not exceeding seven years, and duly registered: provided always, that any person being an assistant to any medical practitioner, or to any chemist and druggist, shall not be required to take out his annual certificate or licence during the time he shall be so actually employed.

Declaration of Assistants and Apprentices.

To the medical registrar for
I, A. B., of declare that I have in my employ [Insert christian and surname; age; whether assistant or apprentice; if apprentice, date of indentures; if assistant, date of diploma]; and I request that you will duly register the same.
(Signed)

N. B.—The person making such declaration must state whether he is a medical practitioner or a chemist and druggist. This declaration must be sent to the registrar before the 31st of November annually.

XXXVII. *Powers and Privileges of Medical Practitioners.*—And whereas certain powers, benefits, privileges, appointments, acts and things, have, by custom, law, or right, been conferred on, or executed, or performed by physicians, or surgeons, or apothecaries, be it therefore enacted, That from and after the 1st of February, 1842, every power, privilege, appointment, and authority, heretofore held by any physician, or surgeon, or apothecary, by any law, charter, or custom, shall be held and enjoyed by persons possessing certificates to practise the art of medicine according to the provisions of this Act, and such persons only.

XXXVIII. *Money Accounts.* — And whereas disputes and differences have arisen as to the right of medical practitioners to recover at law charges for professional visits and consultations, be it therefore enacted, That any person duly qualified to practise the art of medicine may recover in any court of law by action of promises, or debt, any reasonable sum of money for professional visits and consultations, together with full costs of suit.

XXXIX. And be it enacted, That from and after the passing of this Act, every medical practitioner, and every chemist and druggist, shall be exempt from serving on all juries and inquests, and all parochial offices whatsoever, and in the militia, and as a constable, and their names shall not be returned in any list of persons liable to serve such offices as aforesaid.

XL. This clause imposes a penalty of £100 on any registrar or his deputy refusing or neglecting any duty enjoined by this Act.

XLI. This clause imposes a penalty of twelve months' imprisonment for illegally obtaining diplomas, certificates, or licences from any registrar.

XLII. This clause imposes a penalty of six months' imprisonment for making a false declaration under this Act.

XLIII. This clause imposes a penalty of £20 for each offence for illegally practising medicine, or carrying on the trade of chemist and druggist.

XLIV. And be it enacted, That every medical practitioner and every chemist and druggist who shall employ any assistant not being duly qualified according to the provisions of this Act, or who shall neglect to make a declaration of any person being an assistant or apprentice in his employ according to the provisions hereinbefore contained; and every person not being duly qualified according to the provisions hereinbefore contained, who shall act as an assistant to any medical practitioner or chemist and druggist, shall pay for every such offence any sum not exceeding ten pounds.

XLV. *Offences how to be tried.*—Offences under this Act may be prosecuted before any two of Her Majesty's justices of the peace in petty sessions assembled, acting in and for the county in which the offence has been committed, &c.

XLVI. And be it enacted, That in every adjudication of a penalty under this Act, and nonpayment thereof, it shall be lawful for the magistrate to commit the offender to any gaol within his jurisdiction, for one calendar month where the sum shall not exceed five pounds, and for three calendar months where the sum shall exceed five pounds, the imprisonment to cease on payment of the sum due, and the costs for the recovery thereof; and the one moiety of every penalty recovered shall be paid to the informer, and the remainder to the treasurer of the medical council for that part of the United Kingdom in which the offence was committed.

XLVII. Any person thinking himself aggrieved by such conviction may appeal to the justices of peace at the next general or quarter sessions of the peace, under such restrictions as are usual and proper in cases of appeal against convictions before magistrates.

XLVIII. Business happening to fall on a Sunday shall be done on the Monday following.

XLIX. And be it enacted, That this Act may be amended or repealed by any Act to be passed in the present session of Parliament.

The above is an abstract of Mr. Hawes's bill: our space will not admit of our commenting on it at present. We may, however, remark, that we think it the best of all the bills, as regards the Chemist and Druggist. Still, we are of opinion that it does not go far enough. We have long been of opinion that medical reform should be based on the entire division of the different branches of the profession: that the medical practitioner should be restrained from selling drugs and dispensing even his own prescriptions; and that the druggist should be prohibited from practising medicine and surgery. It may be urged that medical men are the fittest persons for making up their own prescriptions: this we deny; and our principal reason for doing so is, the notorious fact, that while it is their only source of remuneration, they will ever send to their patients a much greater quantity of medicine than is absolutely required. For this paltry mode of remuneration a scale of fees might be substituted; and we feel convinced that there is not one respectable medical practitioner who would not be delighted with such an improvement. It would render the profession far more respected by the public than under the present system they ever can be—the members of a noble profession will no longer be identified with tradesmen. One of the chief advantages of a patient going to a physician, is the fact of the latter prescribing no more medicine than is required. Under the present system, if a medical man, on visiting a patient, finds that attention to diet is all that a patient requires, he will have taken this trouble for nothing, unless he sends in some medicine: under the plan we have proposed, he would give the necessary advice, and charge for his *visit*.

Druggists should have the SOLE DISPENSING of drugs; and should be compelled (as provided by this Act) to pass an EXAMINATION as to their fitness for their important avocation. In order to prevent them from adulterating drugs, as it has been urged they would do under such a disposition of affairs, a certain number of officers might be appointed to go round and inspect the drugs in their shops, and to take samples of those suspected, which samples should be sent, for the purpose of being analysed or tested, to a chemical officer of the proposed senate; or, if such an officer be not appointed, to any other experienced practical chemist who might be thought fit.

We recommend Mr. Hawes, whose bill, as far as it goes, gives us much satisfaction, to graft some clauses in it to the above purport: we are confident that such a measure will be hailed by all who have no sinister motives for opposing it—no personal desires to gratify by its rejection.

We strongly advocate the clause providing for the establishment of a "British Pharmacopœia."

A Letter to H. WARBURTON, ESQ., M.P., *On the Utility of extending the Provisions of his bill to Chemists and Druggists; and on the Necessity of extinguishing Quackery by Act of Parliament.* By A DRUGGIST. London: E. Lumley, Chancery Lane.

This pamphlet is eminently worthy of the attentive perusal of chemists and druggists, as being a very able *exposé* of the flagrant abuses existing in that part of the medical profession to which they belong. It likewise contains some remarks on the necessity of making Mr. WARBURTON'S Bill applicable to the reform of these abuses. We are of opinion that Mr. W.'s bill would do but little towards this reform.

Want of space, occasioned by the necessity of inserting an abstract of Mr. HAWES'S Medical Reform Bill, precludes us from giving an extract from, or noticing at greater length this excellently written little pamphlet. Every druggist should purchase it; and it is no less interesting to the public generally, to whom we earnestly recommend its perusal.

EXEMPTION OF CHEMISTS FROM SERVING ON JURIES.*

Our readers will observe with pleasure, that Mr. Hawes has inserted in his bill a clause, providing for the exemption of Chemists from serving on juries, &c.*

LATE HOURS AND SUNDAY TRADING.

To the Editors of the Chemist.

GENTLEMEN,—The encouragement you gave me, by inserting my letter in No. IX. of your useful work, has induced me to address you on a subject of great importance: I mean "Late Hours," and "Sunday Trading."

The generality of Chemists in this part of London open shop at 7 o'clock, A.M., and close at 11 P.M., except on Saturday, when the hour for closing is 12 P.M. By no class of persons is this practice so severely felt, as the young apprentices. It frequently makes fearful inroads upon his constitution, and leaves him no time for "mental culture," or for increasing his scanty stock of chemical knowledge, by study, or experiment.

Who is able, amidst constant interruption, to devote that attention to the science of Chemistry, which it absolutely requires? After 11 o'clock most apprentices are glad to creep off to bed. Provided all would agree, there could be no possible objection to closing at least one hour earlier. As regards "Sunday Trading," this, I am sure, might be very much curtailed, for the dispensing of prescriptions and medicines absolutely necessary, forms but a very small portion of the business done on the Sabbath.

Let me beg of you, Gentlemen, in the name of the Chemists' apprentices of London, to exert your influence in bringing about a proper UNDERSTANDING among our masters; this is *all* that is required; they would enjoy any additional relaxation as much as ourselves. I remain, yours most respectfully,

AN APPRENTICE.

Chelsea, Nov. 12, 1840.

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* See *The Chemist*, No. VII. p. 212. and VIII. p. 247.

CAUTION AGAINST THE PERNICIOUS EFFECTS OF COPPER, PARTICULARLY ADDRESSED TO ELECTROTYPE EXPERIMENTALISTS.*

BY J. P. SIMON, M.D., OF DOVER.

Within the last two months, I have been engaged in a series of experiments in the new art of electrotype, and in that short space of time, I have dissolved not less than thirty pounds weight of sulphate of copper. In all my former experiments, I did not experience any apparent ill effect from the absorption of that salt into my system; but whether it was owing to the smallness of my surgery (or rather factotum laboratory) in which all my electrotype experiments are conducted, or to my being like the rest of my nation, French, of rather a restless and impatient nature, and in consequence of this impatience, pouring hot water on the blue vitriol, and in order to hasten its solution stirring it about until nearly ready for use, I know not. Of course, during that process, I inhaled the copper vapour in quite sufficient quantity to curdle any sweet milk I might have had in my stomach. Yet I was perfectly unmindful of that, and not being afraid to put my finger in the pie, as they say, I would often make use of the forceps of Adam instead of a glass stick, and at length I began to feel uneasiness between my shoulders, with head-aches, (to which I am not subject) shivering, and occasional pain in the epigastric region. I am naturally yellow, but I became pale, and experienced what the French call "vertigo," with prostration of strength and dimness of sight: but this is not all; the nervous papillæ of the tongue became tumefied and horribly annoying, I first thought that I had scalded my tongue with a mouthful of hot broth, and I armed myself with patience in the hope that time would relieve the inconvenience, but it was not so; the evil increased rather than abated, and the tongue became ulcerated in the centre, and considerably swollen on each side; and it was furred as if a "tartine" of spermaceti ointment had been nicely spread over it; the fauces also became tumefied and inflamed, while the soft palate, or roof of the mouth became coated with petechiæ, resembling the measles; and with that tumefied gums and slight ptyalism. Being also engaged in Daguerreotype experiments, I thought of attributing all this to the influence of iodine, which I also freely handled.

I was at last obliged to suspend my experiments, and use all possible remedies to restore my impaired health. Having probably and fortunately escaped the deleterious effects of copper, I thought I might renew my experiments, and although I had observed that after having washed my hands three or four times the water became blue from the system being contaminated with that mineral, yet I was more inclined to think I was under the influence of iodine rather than copper, although I often felt a copperish, cold, subacid taste, particularly in opening my mouth to inspire fresh air, the oxygen of which, perhaps, formed with it an instantaneous oxide of copper, communicated to the gustatory nerves, or nerves of taste. I dissolved only two or three pounds of the salt of copper in the usual way, and on the second day of my electro-chemical amusement I began to feel head-ache, and uneasiness about the fauces and soft palate; first, the affection appeared on the tip of the tongue, but now it shewed itself as above.

With considerable itchiness, and feeling all of a sudden as if I was going to faint, I opened my surgery window, and, for the first time, I felt convinced I was labouring under the influence of that poisonous mineral. I then looked in my mouth and *saw* and *felt* that the just lost complaint was fast returning. I washed my hands, and *three* times the water in the basin became blue. I then determined on using more caution, regretting only the necessity of taking antidotes, one of which was pleasant enough, viz. syrups in quantities, according to the celebrated Orfila. But the physicky part I do not much like, for though I may like to prescribe a large dose to my neighbour, I like it better for him than for myself.

Should the above lines deserve your notice, as tending to prolong the lives of your scientific readers, pray insert it, and that I am yet spared to relate to you my very fortunate escape, thanks be to Providence.

Castle Street, Dover,
Nov. 11th, 1840.

REMARKS ON THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN, AND THE "MATERIA MEDICA PURA."

BY MR. YOUNG.

To the Editors of The Chemist.

Gentlemen,—As Homœopathy is a subject which may be considered rather foreign to a work expressly dedicated to Chemistry, Chemical Manufactures, and Pharmacy,—yet as it is not to be supposed that Chemists are mere automata, and do not desire to know the power and virtues of the medicines they compound, it is hoped the following meagre sketch of a science which is making much progress, may not be altogether unacceptable to the readers of the "Chemist." Your obedient servant,

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* Communicated by the Author.

Robert Young.

Samuel Hahnemann was born at Misnia in Upper Saxony, in the year 1755. After completing his school education, he studied natural history, and natural philosophy, and proceeded to the University of Leipsic to prosecute the study of medicine. He had not long studied this art ere he became dissatisfied with its principles, and the various conflicting and contradictory opinions of its professors. He found every thing in this department obscure, vague and hypothetical, and resolved to abandon the medical profession. Having been previously engaged in the study of Chemistry, he determined on translating into his native language the best English and French works on the subject.

It was whilst engaged in this undertaking and in translating Cullen's Materia Medica, in 1790, that he was struck with the action of cinchona bark in fevers. He was anxious to ascertain its mode of action, and being at the time in the enjoyment of perfect health, he commenced taking internally the usual doses of that substance, and in a short time he was attacked with all the symptoms of intermittent fever, similar in every respect to those which that medicine is known to cure. Struck with this remarkable fact, a new and sudden light flashed upon the soul of the friendless student; he divined, as it were in a moment, the great truth which is the fundamental principle of homœopathy, viz. that "*Similia similibus curentur;*" but he did not stop here; he did not build up a rash theory; he took nothing for granted; he did not intrude his crude opinions upon the medical profession. Years of patient investigation and acute suffering passed over before he gave to the world an account of his discovery that substances "possessed an inherent power of exciting in healthy subjects, the same symptoms which they are said to cure in the sick." In 1796 he published his first article on homœopathy; a work on the Virtues of Medicine in 1805, and the "Organon" in 1810. He commenced as a public medical teacher at Leipsic in 1811, where with his pupils he zealously investigated the effects of medicines on the living body, which formed the basis of the "Materia Medica Pura," which appeared during the same year.*

In 1824 the Homœopathic doctrine was embraced by Rau, physician to the Duke of Hesse Darmstadt; by Bigelius, physician to the Emperor of Russia; by Stegmann, Hufeland, and many other names celebrated in medicine. The writings of Hahnemann have appeared in six different languages, and the "Pharmacopœia Homœopathica," contains a list of 311 medical men, who practice the art of medicine as taught by him. I shall endeavour to give a rough sketch of the most prominent facts connected with this doctrine, not with the notion that I am capable of doing justice to the subject, but merely to give an idea of the science to those whose reading may not have tended that way.

If a medical practitioner be asked the cause of apoplexy, he will tell you, determination of blood to the brain: ask him the cause of heartburn, his answer will be acidity at the stomach: and yet, methinks, a schoolboy might tell him that the determination of the circulating fluid must have some cause—that the acidity must likewise proceed from some other derangement. Hahnemann argues that all disease proceeds from derangement of the dynamic power or vital force: and the cause (that is, the mode in which external objects, exposure, &c., act upon the vital energy) must for ever be hid from the human intellect.

All medicines, when administered to an individual in perfect health, produce symptoms more or less perceptible; that is, they produce deviations from the normal state, or in other words, disease. If, for instance, a healthy person take a dose of rhubarb, does it not produce diarrhœa? Yet, what medicine so efficacious as rhubarb in a relaxed state of the bowels? If opium be given to any individual it will produce excitement, head-ache, &c.; yet opium is given as a sedative to counteract these symptoms. Mercury is a specific in syphilis; yet, when administered internally to healthy individuals, it produces ulcers, &c., so closely resembling those of syphilis, that medical men themselves cannot distinguish the difference. If cinchona-bark be administered to a robust man in perfect health, and persevered in for some time, it will produce all the symptoms of intermittent fever; yet bark is a specific in this disease.

The name Specific was given by physicians to medicines whose action was uniform and efficacious in certain diseases: there was no mistaking, no hesitation; the disease was ascertained, the remedy was prompt and salutary. Yet physicians did not understand the action of these remedies to which they gave the name of specifics; they were at a loss to account for the manner of their action. Hahnemann has discovered this mode of action; he has followed out the law of specifics, and, after patient study and attentive investigation, has ascertained that all medicines produce disease of some kind or other, and that it is this property of producing disease which enables the physician to cure with them diseases similar to those they produce. Homœopathy is therefore the law of specificity extended so as to embrace all diseases, as far as our knowledge of Materia Medica will permit.

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* For most of the particulars of the life of Hahnemann, I am indebted to the preface of the Organon, written by Samuel Stratten, M.D.

In proof of the above assertions I will mention a few facts, which will prove that medicine produces disease, and that the same medicine will relieve symptoms similar to those it produces.

I. Two plants of *Aconitum napellus* were procured in full leaf and flower; the leaves were separated from the stem, placed in a Wedgewood's mortar, sprinkled with cold water and beat into a pulp: pressure was employed, and one ounce of juice procured. This was mixed with an equal quantity of spirit of wine; after twenty-four hours the supernatant liquor was decanted. The liquor was then preserved in a well stoppered bottle, and marked, "*Spirituous solution of Aconite.*"

II. One ounce of the fresh root, cut into small pieces, and macerated in four ounces of proof spirit for six hours, filtered and preserved for use. Marked "*Tincture of the Root of Aconite.*"

III. One ounce of the fresh leaves was macerated in four ounces of proof spirit for four days, filtered and preserved for use. Marked, "*Tincture of the Leaves of Aconite.*"

"An assistant, whilst engaged in making these preparations, touched the tip of his tongue with the root of the plant, which excited an acrid taste, followed by loss of sense. Six minutes after, he was seized with violent pain in the region of the heart, increased by inspiration, which continued two hours.*

"A strong healthy female, twenty-four years of age, was seized with severe pain in the right side, extending to the shoulder-blade on inspiration or cough. This state followed exposure to cold a few days previous to the attack; the "Spirituous Solution of Aconite" was administered in doses of about 8 drops in water. The pain subsided after the first dose."

"A weak emaciated man was seized with severe pain under the scapula, which was aggravated by muscular exertion or a full inspiration; he was ordered to be cupped over the painful part, and subsequently to use purgative medicines, which he did without relief. Twelve leeches were afterwards applied, by which a large quantity of blood was drawn. The pain still continuing, the spirituous solution was administered with complete success as in the preceding instance."

"In a third case, where pain of the side existed, such as is generally denominated a *stitch*, it was promptly and permanently relieved by this solution given in minute doses."

It would occupy too much space to mention more of these cases, and besides, would not answer my purpose, as the doses are not Homœopathic, although they demonstrate the principle,—*similia similibus curentur.*

In my next communication I shall endeavour to explain that part of Homœopathy, which more nearly concerns chemists, viz. the mode of preparation of Homœopathic Medicines, their action, and the manner in which they are administered.

ERRORS IN DR. THOMSON'S DISPENSATORY.

To the Editors of The Chemist.

Gentlemen, — Your correspondent's letter, signed J. H., which appeared in *The Chemist*, No. VIII. pointing out the errors which occur in Thomson's *Conspectus to the Pharmacopœias*, and passing a well-merited censure on Dr. A. T. Thomson for allowing the work to issue from the press without first taking care to correct the many mistakes contained therein, no doubt met the approbation of most of the readers of your useful Journal.

Allow me now to direct attention to the errors which are to be found in the ninth or last edition of the same author's London Dispensatory,—which ought to be a safe book of reference; and indeed, such are its pretensions; but in the present edition, some of the blunders are of such magnitude that ignorance of their existence would be likely to bring an establishment into disrepute, and may possibly be productive of unpleasant consequences.

What I believe is considered the leading feature of the new Pharmacopœia, is the adoption of the imperial pint, containing f ℥ xx, in place of the old wine pint of f ℥ xvi. Of this change it is very important that every person at all concerned in the preparation or dispensing of medicines should be acquainted; but what is apparently most extraordinary, the Dispensatory tells us that the f ℥ xvi is still the measure of the London College, and a table of the proportions of the wine gallon is also given, just as if no alteration had taken place, when in the same book, the weight of the substances in all the formulæ of the old Pharmacopœia which are retained in the new one is directed with the proper increase in order to meet the increase of f ℥ iv to f ℥ xvj which makes the imperial pint. To impute the imperfection to ignorance would be absurd: the excuse probably is, that it was an oversight, but, to say the least of it, great neglect is evident. In addition to this the formulæ of the London and Dublin Colleges are confounded together, and must, without watchful care, be the cause of continually recurring mistakes. I mean that some of the formulæ of the London and Dublin Colleges are included together in the same paragraph, and no distinction made, the same as they were when the pints of both colleges were alike; now, if it be always remembered to use the f ℥ xx pint for both colleges, no mistake can happen where the weight and measure of both colleges were the same in the old Pharmacopœia, but in other formulæ where the weight of substances ordered by the Dublin College was, nor is, not the same as that ordered by the London College, and the difference is shown, in a parenthesis as it was in the old Pharmacopœia, when the f ℥ xvj was adopted by both colleges, error may probably ensue, because attention to this book renders it likely for a person to err in two ways; 1st, Supposing that from any other source he is made aware of the alteration in the measure, he is not reminded in the Dispensatory that the Dublin pint contains only f ℥ xvj, and he may use the f ℥ xx pint, which would make the London preparation right, but the Dublin preparation would be wrong; and 2d, Supposing him to be ignorant of the change in the measure, and using the f ℥xvj pint, the Dublin preparation would be correct, but the London incorrect. The formulæ for tinct. guaiac. may be referred to as an illustration of what is here stated.

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* *Vide* Stratten's Notes to the Organon.

In conclusion, I think it is a pity that a book which has been usually presumed to be pretty correct, should be chargeable with the imperfections which disgrace the Ninth Edition of the London Dispensatory, imperfections which are undoubtedly calculated to mislead and deceive.

I am,
Gentlemen,
Your obedient humble Servant,
P. H.

ON THE FORMATION OF MERCURIAL OINTMENT, BLACK WASH, AND BLUE PILL.

BY MR. JOHN MACKAY, EDINBURGH.

To the Editors of The Chemist.

Gentlemen,—Observing a communication from one of your correspondents, in the last number of your journal, regarding the killing of mercury, I would take the liberty of offering you a few remarks on the subject.

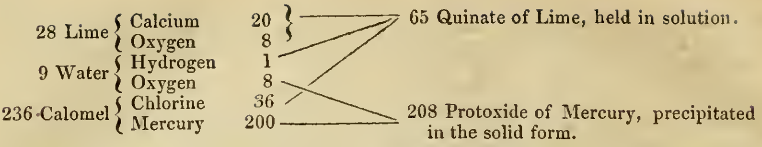
The formation of the mercurial ointment and pill, has long been a source of discomfort to all connected with the laboratory: the patience of both porter and apprentice has been frequently exhausted, from the continued rubbing requisite to render the combination perfect. Numerous methods have been recommended for facilitating the production of the ointment.

Your correspondent has stated the objections as urged by Mr. Phillips, against the use of either ol. sulphuræ, or the spirit. terebinth. But there is, I think, nothing which seems to diminish the labour attendant upon the production of this compound, so much as the use of a portion of old ointment. It certainly possesses this advantage, that it is not at all objectionable. Mr. Phillips mentions this in a cursory manner, but it has been neglected by your correspondent, because the why and wherefore are not given.

There exists a mystery regarding this mercurial preparation, and it is as yet uncertain to what salt it owes its power; yet it will be found, that the addition of a portion of old ointment, will greatly facilitate the production of an uniform compound.

To attempt to arrive at any thing like a satisfactory conclusion, with regard to the existing compound in the ung. hydrarg.—the question at first sight would be, what salt is formed by rubbing together the metal and fatty matter? This might readily be answered, by stating the generally received opinion,—that the protoxide of mercury is the exciting agent. This is plausible enough, since we know that the minute division of the metal, and the presentation of the particles so frequently to the action of the atmosphere, are favorable to oxidation. But, on the other hand, this theory is in a great measure refuted by the simple fact, that an ointment, formed by mixing the carefully prepared oxide with lard, does not produce the same strong effects as the blue ointment.

It is even yet a matter of doubt, as to the active preparation in the black wash. This lotion is much famed for its healing virtues, and which general opinion ascribes to the oxide of mercury. There are some, however, who differ upon this point, and declare the beneficial results of its application to arise from the stimulating property of the muriate of lime, which is formed by the decomposition of the calomel. The following diagram will better illustrate this. We take the ingredients in their atomic proportions:—


28 Lime
Calcium 20
Oxygen 8
9 Water
Hydrogen 1
Oxygen 8
236 Calomel
Chlorine 36
Mercury 200
65 Quinate of Lime, held in solution.
208 Protoxide of Mercury, precipitated in the solid form.

Now the muriate of lime present, as shewn by the above, is almost entirely overlooked, when speaking of the action of the *lotio nigra.* We know that the oxide of mercury applied moistened to a sore is nearly inert, but possesses a very different power when combined with the *murias calcis.* From this might we not argue, that good effects may be produced by using the solut. mur. calcis alone? It certainly would be more cleanly in its application than the old lotion. The London College, in their formula for the preparation of the strong mercurial ointment, direct that suet be first employed to kill the quicksilver. From this it would appear to me, that as sebacic acid is contained in large quantity in this substance, that a sebate or sub-sebate of mercury may be formed. And as this acid is also present in rancid lard, in greater proportion than in fresh, may it not explain, why fat partially in this state hastens the formation of the ointment, and why, during the trituration this rancidity partially disappears? Not that I would come at once to the conclusion that it would be prudent in every case to use spoiled lard for the purpose of making this ointment, but think it is a matter for investigation. But may not the old ointment act in a similar way? If, by keeping the ung. hydrarg. for some time, more sebacic acid be formed, may not its combination with the metal be the means of hastening the operation? I have been told that some use rancid lard, from the circumstance of its combining with the mercury more readily than the new. If, however, the old ointment answer equally well for this purpose, it would be better to employ it.

Dr. Duncan, in speaking of this preparation, says: "proposals have been made, for diminishing the labour, but they are in general hurtful to the efficacy of the preparation, except, the addition of a portion of *old mercurial ointment, which, like a ferment, promotes the formation of the new.*" This language is somewhat obscure, but tends to support the theory which I have advanced.

I am also inclined to suppose, that in the preparation of the blue pill, much is dependent upon the quantity of free acid present in the fruit of the conserve employed.

At the present time, when the greatest difficulties are being surmounted, this particular part of chemical manufacture has not been overlooked. Some wholesale drug establishments have got mercurial mills erected, for the purpose of making blue ointment and pill mass. It is now some time since I have seen one of those mills in operation, but from recollection, the following appeared to be the construction:—

A deep groove is cut in a solid, circular piece of marble, into which dip four metallic handles, all connected to one rod, which is moved by the engine, and serves to make the arms revolve within the groove. Placed before each arm, are four large balls, of a sufficient size to move easily within the space. If the circle be not large, three arms and balls are substituted for four. When in operation, the materials are placed within the groove, and by the motion of the arms the balls are trundled gently forward, and this operation goes steadily on, until the combination is complete. The expense of erecting a mercurial mill, where a steam engine is employed, as for moving grinding stones, sifters, &c must be inconsiderable. It may also be erected at such a distance from the machinery, as to obviate the principal objection hitherto urged against its use, namely, the great heat always thought unavoidable where machinery was employed, and which of course would liquefy the fatty matter, and prevent the preparation of the ointment.

I fear that I have trespassed upon your valuable time and space, but the question is one of such an interesting nature, as to demand some enquiry.

I have the honour to remain,
Gentlemen,
Your most obedient Servant.
JOHN MACKAY.

Edinburgh, 13th Nov. 1840.

KILLING OF MERCURY.

We have this month received many communications on this subject, from which we select the following, being all that we have room for at present:—

GENTLEMEN,—I beg leave to offer to "A SUBSCRIBER" the following hints respecting the "killing of Mercury, as he wishes to know the best mode of killing—say six pounds at a time."

Mercury has not a very willing affinity

for lard, without much tedious trituration; however, their union is greatly promoted by the addition of old mercurial ointment, as my experience has proved the fact for the last ten years. Dr. Stratten, of Dublin, in his Lectures on this article, recommended this plan, and I have ever since found it to save much time and trouble; I may almost say, that a small quantity may be made by this plan, in as many minutes, as could by the old plan in so many hours.

I can only offer a conjecture as to why a portion of old ointment facilitates the division of the mercury, since it remains a disputed point as to whether the mercury in the ointment is in a state of minute subdivision, or in a state of oxidation. Whichever way it acts, the fact is certain that old ung. hydrarg. will very quickly disperse and absorb the particles of fresh mercury, whereas it would take a very long time with fresh mercury and fresh lard alone to do it.

For making six pounds of ointment, I would recommend half a pound, more or less, of old ointment to be put in the mortar, to which add all the mercury that is intended for the six pounds; these are to be well triturated together, gradually adding small portions of the fresh lard, until one pound is added—the trituration must be kept on until no globules can be discovered, which may be tried by besmearing a small portion of it upon white paper with the finger; if it be sufficiently comminuted, not the least globule of mercury can be seen by the eye, nor even by a magnifying glass. (Unless this point is attended to, the mercury is only wasted, and the prescriber disappointed in its effects.) Then the remaining portion of lard is to be added, to be well and equally mixed with the rest, and the operation is finished.

The reason why I would not use all the lard at once is, because it is, not only unnecessary, but its absence facilitates the labour and difficulty of using the pestle; besides, when there is only a small quantity of lard in the mortar, the pestle presses upon a much larger surface of mercury than if it contained much lard.

As to the theory of its combination with the lard, I would presume that the following has a degree of plausibility: As mercury is so easily oxydized, it is probable that a partial oxydation takes place during the process of its subdivision and trituration; and I shall produce a fact which tends to prove that a chemical change has taken place, between the mercury and the lard, and that is, the peculiar smell of ung. hydrargyri. The crude mercury has no particular smell; the lard, again, unmixed, has nothing of the smell of that ointment: then I conclude: that something more than a mechanical change has taken place during the process of "killing" this mineral. I am, sir, your obedient subscriber,

Corvenius.

Corwen, Nov. 10, 1840.

KILLING OF MERCURY.

To the Editors of the Chemist.

Gentlemen,—In answer to the request of one of your subscribers, respecting the Killing of Mercury, as it is called, I beg to trouble you with the following remarks, taken from a Weekly Medical Paper:—

The Modus Operandi is to divide or oxidize the silver with oxygenated stearine. This article is found in its purest and best form in the London Stearine Mould Candle. Why in the London Stearine Mould Candle? Because it is made of the best mutton suet, washed, and then pressed; the oleine exuding, the stearine is then exposed to the atmospheric air, and made into candles, and in this state it is ready for use. You will probably say, "Why not prepare it yourself in this way?" My answer is, it is impossible to procure the same article but by the same extensive and tedious process, and when you can obtain it so readily in this form, it would be a work of supererogation. I might as well attempt to make Barclay's porter in a tea-kettle.

The process and formula are as follows:—Take stearine (London Mould Candle), separated from the wick ʒj., rub it until it assumes the appearance of cold cream; then add ʒiv. of quicksilver, and in ten minutes it will be effectually reduced; the hog's-lard may then be added, according to the strength required.

The Pil. Hydr. and Hyd. cum Creta may be made in the same way. The stearine does not interfere in the slightest degree with either the effect or appearance of the preparations. These remarks are well worth the attention of your correspondent.

I am, Gentlemen,
Most respectfully yours,
A Constant Subscriber.

Dartford, Kent.

N.B. Having made *all* the above articles, I shall be happy to answer any question for the information of your readers.

CURE FOR GOUT.

To the Editors of The Chemist.

Gentlemen,—Although you may be startled by the announcement of the discovery of a cure for gout, I can nevertheless assure you of the fact that such a discovery has been made, and that it consists in the external application of Sp. Sal. Volat. (Sp. Ammon. Arom.) to the part affected.

If it be objected, that there can be no cure for gout, seeing that at longer or shorter intervals it may return, I answer that, upon such grounds, sulphate of quinine might be objected to as a cure for ague. Waiving, therefore, such objections as unphilosophical and contrary to experience, I will at once proceed to describe the manner of making the application of spirit of sal volatile, which consists merely in gently rubbing it with the hand on the gouty member. In a few minutes the pain will be assuaged, the inflammation will speedily subside, and, in due course of time, the swelling disappear. As often as the pain returns, the application must be repeated, till the paroxysm is at an end. I scarcely need premise, that attention must be paid to the state of the bowels.

Gentlemen, I leave to you the explanation of the *modus operandi*, upon chemical principles, my object being merely to obtain for this discovery a place in your valuable work; conceiving that thereby the greatest benefit to gouty sufferers will arise, inasmuch as it will thus be brought under the immediate notice of the scientific world.

I will add only that, so far as my experience goes, no danger can arise from the spirit of sal volatile, which is not a repellant, but simply a chemical agent.

I am, Gentlemen,
Your most obedient humble servant,
A Friend to the Gouty.
7th November, 1840.

NOTE ON CREOSOTE.

FROM A CORRESPONDENT.

Some of your readers may, perhaps, have noticed the fact I am about mentioning, and may be able to explain the cause thereof,—viz. that creosote, on long standing in the light, gradually becomes discolored, until it eventually assumes a dark brown colour, and is thereby deteriorated in its peculiar properties. It is well known that the rays of light have quite the reverse effect in decomposing most fugitive vegetable colours on exposure to light; in some instances even in a very few days.

SAPONIFICATION OF A HUMAN CORPSE.*

In the cemetery of Cluny, near Lyons, a body has been found in a well-preserved state of saponification. The muscular or fleshy parts were white, hard and compact, like soap, of which they had all the appearance. They were soft to the touch, like talc or spermaceti, and presented no traces of vessels, nerves, or tendons: all was homogeneous. The heart, which was quite intact, was a complete saponaceous mass. The non-muscular viscera, such as the lungs and intestines, were shrunk to a twentieth of their ordinary size. The head, which doubtless was not surrounded, like the other parts of the body, with a bed of earth favorable to its preservation, was very much decayed. The eyes, the nose, the ears, &c., were reduced to dust. Some hair, in its original condition, was lying on the winding-sheet, which was mouldy or decomposed; this hair could be collected in parcels.

FORMULA FOR A SEDATIVE APPLICATION IN CASES OF OBSTINATE HEAD-ACH, CONGESTION AND CEREBRAL FEVER.*

BY M. RASPAIL.

Liquid Ammonia . .	100 grammes.
Distilled Water . .	900
Purified Sea Salt . .	20
Camphor	2
Essence of Rose . .	Q. S.

The whole to be dissolved cold.

Mode of use.—A cloth is dipped in this water, and is applied immediately over the part of the cranium which the patient points out as the seat of pain, taking care that none of the liquid runs into the eyes, which may be prevented by a bandage over the eye-brows.

The sedative effect almost instantaneously takes place: even head-aches of intolerable violence, accompanied by photo-phobia and retraction of the eyeballs have disappeared after a quarter or half an hour; and on the simple application of a cloth once dipped in.

The cloth is dipped in every time a new attack seems to be threatened, and left on the head until it is necessary to steep it *de novo*.

PRESERVATION OF CANTHARIDES.†

BY M. RIQUET.

At the season of gathering cantharides, I think it my duty to make known a method of killing them, which I have not seen described any where. This method, which is very simple, consists in putting them in a bottle or other vessel hermetically closed and in thus exposing them for some hours to the sun. The fuller the vessel is, the sooner asphyxia will take place; it will be produced sooner by elevation of temperature. When it is desired to operate quicker, a few drops of ether may be put in the vessel.

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* *Journal de Chimie Médicale*, Oct. 1840.

* *Ibid.*, Oct. 1840.

† *Journal de Chimie Médicale*, Oct. 1840.

By operating in the above manner, it seems to me that they are more easily preserved than by means of vinegar.

HUFELAND'S ANTI-VOMITIVE MIXTURE.*

R. Tincture of aloes } ā ā......3·18 gram.
Tincture of castor }
Tincture of orange peel......6·36 ,,
Mix: *for internal use.*

Hufeland has recommended this preparation in chronic vomiting owing to atony of the stomach, especially in hysterical persons.

Fifteen drops to be given in the morning, at noon, and at night.

Each dose is to be administered in half a cupfull of a weak infusion of fennel seed, properly sweetened.

DR. PLISSON'S SEDATIVE POWDER IN CASES OF NEURALGIA AND CHRONIC RHEUMATISM.†

R. Muriate of morphia........0·30 gram.
Camphor, in fine powder } ā ā 2·00 ,,
Castor or saffron...... }
Aromatic spices............25·00 ,,
Mix and label it:—*Powder for external use.*

Sprinkle with this mixture a new and well heated flannel, with which the affected parts are to be covered: renew this application morning and evening.

The action of this topic should be assisted by a few cups of a weak infusion of black tea, Roman camomile, orange flowers, or a little sage.

For more than ten years Dr. Plisson made frequent use of this powder, which he has found very beneficial in many cases.

ON THE EFFECTS OF EXTRACT OF HYOSCIAMUS, AND ON THE MEANS OF COMBATING THEM EFFICACIOUSLY.‡

BY SIGNOR MEDORO.

Signor Medoro gives an account of four cases in which extract of hyosciamus produced identical symptoms. These symptoms seem to have borne great analogy to those of mental alienation, and consisted of spasmodic contractions of the muscles of the face and of the lower jaw, and of twitchings of the tendons. After all the antispasmodic and antiphlogistic routine of treatment had been tried in vain, lemon juice was exhibited, and all the symptoms very soon abated.

ON THE THERAPEUTIC EFFECTS OF CROTON OIL IN CERTAIN AFFECTIONS OF THE NERVES.†

BY DR. NEWBIGGING.

I observed that for some time the only action it was supposed to possess on the animal economy, was that of active purgation, until Sir Charles Bell pointed out its effects on neuralgia. Not that it would be found to remove the affection in all cases, which was impossible in those depending on certain organic changes. He then detailed a number of cases to prove that it possessed a specific power over the nervous system, independent of its general action as a purgative. The diseases in which the power was exhibited were severe sciatica, which had baffled every other treatment; convulsions in children, and epilepsy, many cases of which it cured; and even in those depending on organic affections of the brain, it rendered the paroxysms less frequent and more moderate. In a case of severe laryngismus stridulus occurring in a child nine months old, Andral exhibited it in minute doses with complete success.

Dr. Abercrombie said he had long used it extensively in affections of the head, and from his experience of it he thought it might possess specific power over the nervous system. As the disease laryngismus stridulus was alluded to, he would mention a remedy he had found very valuable in its treatment, which was a combination of carbonate of iron and rhubarb with musk.

Sir C. Bell had found several forms of severe neuralgia, particularly occurring in the extremities, as in the finger or toe, over which croton oil had no power. It was in facial neuralgia that it proved most serviceable, or in neuralgia occurring elsewhere, accompanied by some indication of cerebral affection. When he considered the great extent of the intestinal tract, and that those diseases may depend on sympathy with different parts of it, he was prepared to expect the necessity of using different purgatives which were known to act principally on different portions of the intestines.

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* *Journal des Connaissances Médicales,* July 1840.

† *Ibid.*

‡ *Il Raccoglitore Medico.*

† *British Association, Medical Section;* Glasgow, 1840.

ON THE PROPERTIES, CHEMICAL AND THERAPEUTIC, OF THE MATIAS BARK.*

BY DR. M'KAY.

The plant from which the bark was obtained, he stated, grew in great abundance in South America; but he was unable to state its botanical characters. From what he had heard he supposed it to belong to the genus Wintersonia. In its native country it was extensively used as a substitute for cinchona bark in intermittents. It was found to contain an intensely bitter extractive matter, to yield on distillation two distinct essential oils, differing in specific gravity, soluble in alcohol and ether, but very sparingly so in water. The principal characteristic substance derived from it was a bitter resinous matter; no alkaloid was discovered to exist in it. Specimens of the bark, its extract, the essential oils, tincture and resinous matter, were exhibited. The principal therapeutic properties were stated to be tonic, aromatic, and astringent. Dr. M'Kay also stated that it had been exhibited with marked success in dyspepsia accompanied by loss of appetite, which it quickly restored,—in phthisis, where tonics were admissible, in which it supported the strength, and prevented rapid sinking; in dropsy it was found to be a valuable adjunct to diuretics; in intermittents it was found to be a valuable substitute for cinchona. It was also found serviceable in such cases of hemicrania, as permitted the use of quinine.

Dr. Newbigging, from extensive use of the drug, corroborated the statement made of its therapeutic virtues.

ON THE MEDICINAL ACTION OF BROMINE AND ITS COMPOUNDS.†

BY DR. R. M. GLOVER.

The principal conclusions from the experiments made to ascertain its physiological action, were as follows:—

Whether bromine be taken into the lungs in the form of vapour, or into the stomach in the fluid form, or be injected into the circulation, it acts purely as a corrosive and an irritant; the action on the primæ viæ is different from that of hydrobromic acid, into which bromine is converted when absorbed into the circulation. The author extends this observation by analogy to chlorine and iodine, and their hydracids.

Bromine exerts an action on the rectum like that of iodine; it is also tonic and diuretic; its remedial virtues are chiefly conspicuous as an external application in the treatment of scrofulous, syphilitic, malignant, and specific ulcers; in these cases, it appears to act as an excitant, and perhaps as a mild caustic; it is also useful in some chronic diseases of the skin.

The bromides of potassium, sodium, and mercury resemble much more the chlorides of these bases than the iodides, in their physiological action. The bibromide of mercury has no advantage over the bichloride as a remedy, contrary to what has been asserted by some French writers. The bromide of cyanogen possesses a double action; in a powerful dose it operates like prussic acid, in a moderate one it produces the most violent symptoms of irritant poisoning, and is the most powerful irritant known. Ammonia is its best antidote.

The chlorides and bromides of olefiant gas exert a remarkable action, introduced either into the stomach or circulation: in the former they produce, in a large dose, death by coma, in a smaller dose, loss of power over the voluntary muscles, sensibility being retained, with difficulty of respiration, from effusion into the lungs; in the latter, when injected in a large quantity into the veins, they cause almost instant death, producing great congestion of the lungs, and destroying the irritability of the heart; in smaller doses death is produced in the same manner as by their introduction into the stomach.

TO CORRESPONDENTS.

Our Subscriber is referred to our advertisement on the cover.

E. W. will find an article on Morphia by Dr. Mohr, at page 361, which will answer his purpose.

We are obliged to P. T.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month.*

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[*] *British Association, Medical Section;* Meeting held at Glasgow, Sept. 1840.

[†] *British Association:* from *The Athenæum.*

INDEX

TO THE FIRST VOLUME.

N. B.—*Particular circumstances having called for two editions of Nos. I., II., and III., slightly differing in their contents, the Index applies to both editions, and a star prefixed to some of the references warns the reader that if the article be not found in one edition it is contained in the other. The first paging refers to the first edition, that in parentheses to the second.*

ABORTION, with symptoms of poisoning, produced by the use of rue. By M. Helie . . . 50
Acids, tartaric, racemic, citric, mucic and gallic acids, on the alteration of, by the peroxides of lead and manganese. By M. J. Persoz. . 327
*Acetates, action of chlorine on the carburetted hydrogen of. By M. Dumas 71
———. *See* Lead.
Acetic acid, on the formation of, from carbonic oxide and hydrogen, in the acetates of copper and iron. By Mr. J. T. Jullion . . . 238
———, action of anhydrous sulphuric acid on. By M. Melsens . 299
Adulteration of flour, new mode of detecting. By M. Sellier . . 222
——— of essential oils with alcohol; detection by means of chloride of calcium. By M. Borsarelli . 253
——— of wax, M. Bonnard on 85
———. *See also* Beer, Bread, Gin, Milk, Olive-oil, Quinine.
Affinities of oxygen and hydrogen for certain bodies: electro-chemical decomposition of water. By M. Edmund Becquerel . . . 232
Affinity, or the power of combination. By M. Azaïs (*See* Electric Current) 289
Alcohol, pyroxilic spirit, and ethers, contributions to the history of. By M. F. Kuhlmann . . 161
———, employment of the vapour of, against the inspiration of chlorine 222
Alcoholic drinks, effects of, on mothers and infants. By Mr. A. Courtenay, Surgeon, R. N. . . . 85
Alizarine, the coloring matter of madder, and its extraction . . 268
*Alkalies, action of alcohol on. By MM. Dumas and Stass . . 70
Ammonia, employment of carbonate of, in scarlatina. By Dr. Bodenius 220
——— in drunkenness . . 220
———. *See* Nickel.
Ammoniacal compounds, investigations concerning the nature and constitution of. By Dr. Kane . . 135
Analysis of limestones, especially of the magnesian kind, and a method of completely separating lime from magnesia, when both are present in large quantities. By Robert E. Rogers, M. D. and Martin H. Boyé . 262
——— of a chromic iron ore, first observed by R. C. Taylor, Esq. at Mahobal, near Gibaro, Island of Cuba. By James C. Booth, and M. Carey Lea 265
——— of anthracite and iron ore. By Professor Johnson . . 266
Angustura, true and false, examination of the barks of the. By M. Genest 199
Anhydrous sulphuric acid, new compound of, with oxide of azote. By H. Rose . . . 235
Animals, mode of preserving . 306
Animal matters, supposed existence of fluoric acid in. By G. O. Rees, . . 43 (42)
*Anthracene, on several nitrates and chlorides of. By M. Laurent . 72
Apprentices, chemists' . 283, 384
Archil and litmus, chemical analysis of 332
Arsenic, mercury, and iodine, on a new chemical combination of, and on its medicinal employment. By Mr. Donovan . . . 41 (40)
———, poisoning with . 25 (23)

Arsenic, experiments on poisoning by. By M. Orfila 191
———, metallic poisoning by; cure by the hydrated proxide of iron. By M. Batillat . . . 91
———, on the existence of, in the bones of man. By M. Orfila 17 (15)
———, detection of, in the blood, flesh, and viscera, after poisoning by arsenic 54
———, on the employment of two new processes for detecting and isolating in organic or inorganic matters. By M. Persoz 160
———, mode of detecting minute portions of. By Dr. Clark, of Aberdeen 350
———, presence of, in cast metal . 149
———. *See* Marsh's apparatus.
Arsenious and sulphuric acids, new compound of. By Dr. Schafhæutl 363
——— acid, experiments on the ac-of tobacco on animals poisoned by. By Signor Florio . . 191
Arthritic concretions, analysis of two. By MM. Pauquy and Bor . 173
Asparagin, on the manner in which it acts under high pressure. By O. L. Erdmann . . 301
Association. *See* Medical Reform.

Baryta, on the decomposition of organic substances by. By MM. Pelouze and Millon 74
———, addition to the note on the decomposition of organic substances by. By MM. Millon and Pelouze . 75
Becquerel's pile, on the pile known by the name of. Letter from M. F. Henrici, to M. Poggendorff . 102
Beet root, on the desiccation of, by cold. By MM. Bonafous and Payen 210
Belladonnine, M. P. Lübekind on 365
Bergamot, essence of, MM. E. Soubeiran and H. Capitaine on . 297
Bile, on the composition of. By M. Berzelius . . . 225
Bitter draught against stomachic oligotrophy 256
Black paint, on the disadvantage of using, on board ship. By Mr. Lewis Thompson 47
Bleaching. *See* Chlorine. Colouring matters. Cotton.
Bleaching powder, experiments on the formation of. By James S. Muspratt, Esq., of Liverpool . . 112
Blisters, M. Trousseau on . . 59
Blistering tissue 254
Bodies, preservation of, for dissection. By Dr. Marshall . 22 (20) 48
Bones affected with softening, analysis of 112
Boracic acid lagoons of Tuscany. By John Bowring, LL.D. on the 36 (37)
Brain, analysis of the substance of the. By M. Pelouze . . . 79
Bread, on the adulteration of. By Charles Watt . . . 276
Bromine and its compounds, on the medicinal action of . . 388
Bronze, chemical . . . 224, 373
Butter melted, and on the mouldiness of butter. By M. Turpin . 140

Calculus, examination of an intestinal, from a horse. By M. J. Girardin 235
Calefaction. *See* Remarks.
Calomel with iodine and sugar . 218
———, on the transformation of, into corrosive sublimate. By Mialhe 104
*Caloric, disengagement of, in multiple proportions. By M. Hess . 68
Camphor of turpentine, investigations concerning. By M. Deville . 77
Cantharides, preservation of. By M. Riquet 386
Capillary circulation, influence of cold on. By M. Poiseville . 16 (15)
Carbon, sulphuret of, investigations concerning. By M. Couërbe. *See* Experiments.
Carbonic acid. *See* Phenomena.
Cashoo, artificial preparation of brown. By M. H. Reinsch . . 21 (20)
——— of commerce, refined, MM. Girardin and Proisser on . 84
Cement, marble, Keene and Co's. 278
Cerate, adulteration of . . 221
Cerebral substance of a fœtus, observations concerning. By M. F. Boudet 154
Ceylon moss . . . 156
Chemical action, on the nature of the odour manifested in certain. Letter from M. Schönbein to M. Arago 193
——— manufactures, on the most important, carried on in Glasgow and its neighbourhood. By Professor Thomas Thomson, of Glasgow . 334
*——— rays, on the permeability of various bodies to the. By Robert Hunt 67
Chelidonine and Pirropine. By M. Potex 300
Chemistry, new work on, by T. Spencer 332
Chlorine gas, new and easy method of generating. By Charles Watt . 6
———, manufacture of . 211
———, combinations of cyanogen with 235
———, on the inconvenience of, in bleaching paper. By M. Coulier 245
Chlorides, bromides and sulphurets of napthaline, on new combinations of. By M. Laurent . . . 201
*Chloride of calcium, &c., action of ferrocyanide of potassium on. By M. Reiset 12
——— of potassium. *See* Mercury.
Chloro-naphthalic acid, and on certain compounds obtained by treating chlorides of naphthaline by nitric acid. By M. Laurent . . . 235

Chloro-sulphuric acid, note on. By M. V. Regnault . . . 9
Chloroxalic ether, memoir on, and its compounds. By M. P. Malaguti 299
*Cholesterine, abundance of, in the animal economy. By R. E. Marchant 9
Chromic acid, on an easy method of preparing, and on the manner in which it acts with sulphuric acid. By M. Fritzche 269
———, on the reproduction of, from the muriate of protoxide of chrome, by means of peroxide of lead. By Charles Watt . . 129
———, dilute, treatment of ulcers, &c., by. By Charles Watt . 248
Cinnamyle, iodide of . 170, 238
Coal, on the properties and chemical constitution of, with remarks on the methods of increasing its calorific effect, and preventing the loss which occurs during its combustion. By Charles Hood, Esq. F.R.A.S. 292
—— pits, on the existence of iodine in the products of the combustion of. By M. Bussy . . 42 (41)
Cod oil, on the presence of iodine in. By L. Gmelin . . . 168
Colchicum seed, case of poisoning by. By Dr. Neubrandt . . 188
Coloring matters, investigations concerning, and on bleaching. By Dr. Robert Kane . . . 80
Combustion, spontaneous . . 237
Composition, chemical, on the relation of form to. By Dr. Schafhæutl 359
*Congelation. By M. Cagniard Latour 68
Conspectus, Dr. Thomson's, errors in 250
Copper, on the presence of, in the human viscera. By Signor Cattanei 251
———, caution against the pernicious effects of, particularly addressed to electrotype experimentalists. By J. P. Simon, Esq., M.D., Dover . 380
———, on the presence of, in various natural products, with processes for detecting it. By M. A. Thieuilieu 200
———, Poisoning by. *See* Memoir.
Copper, sulphate of, as a vomitive . 254
———, exhibition of small doses of sulphate of, in hooping-cough. By W. P. Chavasse . . . 222
———, method of separating palladium from 237
———, purification of. By Mr. Lewis Thompson . . . 46
Cotton goods, fraud as to . . 120
Correspondents, (32) 96, 128, 160, 192, 224, 256, 288, 320, 352, 388
Cotton, process for bleaching . 368
Creosote, note on . . 386
———, compounds of. By M. Laurent 269
——— in gonorrhœa. By Dr. Allnatt 121
Crystalline lens. *See* Proteïne.
Croton Oil, on the therapeutic effects of, in certain affections of the Nerves 387
Crystallographic notation, on a new method of. By Mr. J. J. Griffin 330

Daguerre, on the discovery of . 18 (17)
*Diathermancy, phenomena of. By Professor Forbes . . 67
Digitalis ambigua, analysis of the leaves of the. By M. Schlæsinger . 172
Dispensatory, Dr. Thomson's, errors in 382
Distillation of animal matter. *See* Remarks.
Diuretic medicines, action of, M. Julia de Fontenelle on . . 217
Drawings. *See* Mercury. Photogenic Designs.
Druggists, exemption of, from serving on juries . . 212, 247, 379
———, medical reform as relates to. Practice of "TICKETING" resorted to by surgeons. Per centage system 247
———, medical reform as relates to, 281
Drugs, market price of . . 64
———, sale of, by ignorant persons 282
Dyeing, physico-chemical investigations concerning. By M. Chevreul 115
———, chemical investigations concerning. On the immediate composition of wool; on the theory of scouring it, and on certain properties, derived from its composition, which exert an influence in dyeing it. By M. Chevreul . . . 176
———, nitric acid &c. in. *See* Remarks.

Earthquakes in Chili . . 14 (13)
Elaterine 94
Elaterite, or fossil caoutchouc . 303
Electric current, on the chemical power of, considered in its relations to affinities. By M. Becquerel . . 164
Electrical properties of bodies, employment of, for the detection of the adulterations of which they are the subject. By M. Rousseau . 47
Electricity, atmospheric, observations concerning. By M. Peltier . 195
Electro-type experiments. *See* Copper.
Elemi, resin of, . . . 237
Embalming, Gannal's process for . 342
Emetic, contributions to the history of the formation of. By Fr. Knapp 132
Errors, chemical . . 270, 303
Essential oils, extract from a memoir on the. By M. Pelouze . 321
Experiments for the accurate determination of the atomic weight of carbon. Letter from M. Dumas to M. Arago 329

Fat bodies, constitution and products of the distillation of. By Professor Redtenbacher and Dr. Varrentrapp 366

Ferruginous medicines, formulæ for 213
——— preparations, M. Beral on 92
Ferrocyanide of potassium . . 12
Fires, great, action of, in preventing storms. By M. Matteucci . . 49
Flesh,—use, as food, of the flesh of animals which have died of disease 256
Fœtus. *See* Cerebral Substance.
Formula for a sedative application in cases of obstinate head-ach, congestion and cerebral fever. By M. Raspail 386
——— for the concentrated tinctures of Haenle . . . 159
Formulæ. *See* Lozenges.
Fraud as to cotton goods . . 120
Free hyposulphurous acid, M. Langlois on 136
French coinage . . . 242
——— measures of weight and capacity 367

*Galvanic series formed of zinc and inactive iron. By Mr. Thomas Hawkins 69
Galvanism, Lenz's remarks on certain points in the doctrine of . 6
———, casting by . . 3
Galvano-plastic art, on the . 344
——— processes of M. Jacobi, M. Demidoff on . . 150
Gamboge as a pigment. By Mr. H. Dircks 240
Garlic (allium cepa) . . 156
Gas, improved method of manufacturing, and preventing smoke from coal fire . . . 207, 343
Gaseous chalybeate water powder. By M. Breton 63
Gelatine, capsules of, description of an apparatus to make. By M. Hunoult Desfontenelles . . . 126
Geology, chemical, Professor Johnston on 331
Gilding without the intervention of mercury, by electro-chemical action. By M. Delarive . . 180
——— without mercury . . 280
Gin, on the manufacture and adulteration of. By Charles Watt . 338
Gold and silver, reduction of, to the metallic state from their solutions in acids. By Charles Watt . 97
Gold, on the precipitation of. By M. Morin 100
Gonnorrhæa. *See* Creosote.
Gout paper 218
——, cure for 385
Glass, flint and crown, manufacture of. By M. Bontemps . . 117
———, manufacture of. By Apsley Pellatt, Esq. 278
——, on the decomposition of. By Sir David Brewster . . . 332
Granatine, M. Landerer on . 269
Gunpowder, experiments on the inflammation and combustion of. By M. Piobert 108

Hachisch 319
Hanging, new sign of death by 32 (31)
———, value of the signs of death by, M. Orfila on . . 58
Head-ache. *See* Formula. Pills.
Heat, animal . . . 270
*Heat, properties of. (*See* Investigations) By M. Melloni . . . 68
Hederine, a new active principle, MM. Vandamme and Chevallier on . 365
Hemlock, solution of extract of, in scrofulous ophthalmia . . 256
Hooping Cough. *See* Copper.
Homœopathic doctrines of Hahnemann, remarks on, and "the Materia Medica Pura." By Mr. Young . 380
Hufeland's anti-vomitive . . 387
Hydrated hydrosulphuric acid, crystals of. By F. Wöhler . . 137
Hydrocyanic acid, on the strength of 96
Hydrophobia, or canine madness, new and successful mode of treating 223
Hyosciamus, on the effects of extract of, and on the means of combating them efficaciously. By Signor Medoro 387

Indigo, compounds from . . 302
———. *See* Polygonum.
*Influence of bromine and of bromide and iodide of potassium in germination. By Domenico Blengini . 9
Insects, coloring. *See* Remarks.
Investigations concerning the quantities of heat disengaged in chemical combustion. Letter from M. Hess to M. Arago . . . 202
Iodine, on the effects of. By Dr. Asmus 216
——— and caustic soda, new salt obtained from. By Professor Frederick Penny . . . 325
———, *See* Arsenic.
Iriscope, the, Dr. Reade on . 366
Iron, specification of Mr. John Augustus Tulk's patent for improvements in the manufacture of . . 304
—— precipitated by zinc. By M. Capitaine 78
*——, on an anomalous electric condition of. By Martin J. Roberts, Esq. 69
——, sulphate of, on the preparation of. By M. F. Boudet . . 105
*——, on the decomposition of the neutral sulphate of the peroxide of, by boiling its solution. By Th. Scheerer 71
——, oxides of, as antidotes for arsenic. By M. Bunsen . . 55
——, syrup of iodide of . . 94
——, saccharine carbonate of . 214

Iron, lactate of, process for preparing. By M. Louradour . . 160
——, lactate of, formula for employing. By M. A. Cap . . . 215
——, lactate of, on various adulterations of. By M. Louradour . 283
——, lactate of, lozenges of . 126
——, sesqui-iodide of, on the preparation and employment of. By. Dr. Oberdærffer . . . 351
——, hydrated peroxide of, an antidote for Scheele's green. By Dr. Spaetr 191
——, hydrated peroxide of, as an antidote for arsenic. By Mr. Newberry 192
——, hydrated peroxide of, an antidote of arsenious acid . . 55
——, action of air and water on. By Mr. Mallet . . . 364
Itch, formula for the treatment of. By Raffaelle Napoli . . 255

Jalap, substitute for . . 156

Kakodyl, on the compound or radical called. By Professor Bunsen . 364
Kalsomine . . . 242
Kwoso, on the flowers of, and their vermifuge properties . . 255

Laffarge, Madame, trial of, for poisoning her husband. Chemical trials. Opinions of the chemists . 316, 351
Late hours and Sunday trading . 384
Laurel water, M. Paton on . 219
Lead colic 125
Lead, on the presence of protoxide of, in the blood of a horse, to which had been administered, in several draughts, a concentrated solution of acetate of lead. By M. Lassaigne 190
——, on the presence of protoxide of, in the animal economy. By M. A. Chevallier . . . 191
*——, decomposition of acetate of, at an elevated temperature, formation of sesquibasic acetate of lead. By F. Wöhler . . . 5
*——, acetate of, successful treatment of aneurism of the aorta by. By MM. Dusol and Legroux . 31
——, fatal effects of acetate of, given in large doses, for pulmonary consumption. By Dr. Bicking, of Mulhausen 122
Leather, new mode of preparing . 306
Leech monopoly . . 189, 213
Leeches which have already been used, danger of employing. By Dr. Puche 284
Licences, patent medicine . 315
*Light and heat, reflected, memorandum on the intensity of. By Professor Forbes . . . 5
Lighting gas, report concerning M. Selligue's memoir relative to new processes for manufacturing. By MM. Thenard, D'Arcet and Dumas. (*See* Gas) 207
————, M. Selligue's . 241
———— from turf . . 280
Lilac, substance extracted from the buds of. By E. Wilson . . 217
Linseed oil and linseed oil varnish. By Justus Liebig . . . 182
Liquor amnii, chemical examination of, from a woman in the fifth month of pregnancy. By M. J. L. Lassaigne 172
Litmus. *See* Archil.
Lozenges, formulæ for. By Mr. Bartlett . . . 125, 190, 250
————, incisive pectoral . 218

M. Daguerre's process, M. Bayeux on 83
———— latest improvement 240
Magnesia, fluid . . . 128
————, Moxon's effervescent . 128
————, separation of lime from 15 (14)
Manganese, separation of cobalt from 237
Mannite of the aguncate tree. By M. Melseus . . . 95
Manufactures of Glasgow. *See* Chemical.
Manures and vegetable tissues. By M. Payen . . . 42 (40)
Marsh's apparatus for detecting arsenic 349
———— on certain causes of error which it may occasion in medico-legal investigations. By M. Louyet . . . 348
————, on a new mode of using, in medico-legal investigations. By M. Lassaigne . . 347
Matias Bark, on the properties of, chemical and therapeutic . . 388
Medical reform bill. Mr. Hawes' . 373
Medical reform. Proposal to form a Druggists' Association similar to the British Medical Association (*See* Druggists) . . . 281
————, educational and practical. By Charles Watt . 307
———— Letter to H. Warburton, Esq., on the propriety of rendering his bill applicable to chemists and druggists. By "A Druggist" 300
Memoir on the means to be adopted for detecting cupreous preparations contained in the human body after poisoning, and of distinguishing them from the copper naturally existing in man. By M. Orfila . . 310
—— of M. Kuhlmann relative to the properties of particles of platina, and to the phenomena of etherification 14, (12)
Mercurial ointment, preparation of 122

Mercurial Ointment, black wash, and blue pill, on the formation of. By Mr. John Mackay, Edinburgh 384
Mercury, on a process for gilding metals without the intervention of, by electro-chemical action. By Professor Delarive . . 180
———, gilding without . . 280
———, chloro-sulphuret of . 40
———, fulminates of, on the alcohol drawn from . . . 85
———, on he iodides of. By M. Souville . . . 169
———, killing of . 384, 385
———, new mode of applying the, to drawings obtained with the Daguerréotype. By M. Soleil . 169
———, on the combination of cyanuret of, with chloride of potassium. By M. Longchamp . . 326
———, solution of bichloride of, in itch 220
———. *See* Arsenic.
Metals, poisonous, manner of reducing 723
Metallic salts. *See* Remarks.
Meteorite, fall of a, in Missouri, February 12, 1839 . . . 39
Meteoric mass, description and analysis of, found in Tennessee, and composed of metallic iron, graphite, hydroxide of iron, and pyrites. By G. Troost, M.D., Tennessee . 260
*Microscope, new means of lighting, by means of the light of hydrogen gas. By M. Al. Donné . 44
Microscopic objects, on an apparatus for drawing, by means of which the photographical representations of these objects may be obtained. By M. Lefebvre . . . 152
Milk, on the composition of. By M Donné . . . 43 (41)
——, adulteration of . . 221
Monesia, a new vegetable, employment of, in medicine. By Dr. J. Martin St. Ange . . 27 (25)
Morphia and its salts, new method of preparing. By Dr. Mohr of Coblentz 361
Morphine, chemico-legal investigations concerning . . . 252
*Moss, Iceland (Cetraria Islandica) 32
Mountains, chemistry of, theory of their formation. By Mr. Edward Bentley . . . 257
Mustard, essential oil of, MM. Robiquet and Bussy on . . 106
———, on the formaticn of the essential oil of. By M. Bussy . 77
———, examination of the seeds of black and white. By MM. Boutron and Frémy . . . 78
——— and horseradish, on the volatile oils of. By MM. Boutron and Frémy 108
Myrrhoïd, a natural exotic substance, resembling myrrh, and myrrhoïdine, the peculiar principle which it contains. By M. L. A. Planche 295

Naphthaline. *See* Chlorides.
Narcissus, meadow, and an active and vomitive principle, narcitine, Dr. Jourdain on . . . 252
Narcotine, a substitute for quinine 24 (22)
Nickel, on the combination of certain salts of, with ammonia. By M. J. Fritzche . . . 269
Nitrate of soda as manure . 306
Nitric acid, action of, on the chlorates, iodates and bromates of potassa and soda. By Professor F. Penny . 325
Nitrites, formation of, in the direct way. By M. J. F. Fritzche. . 267
Notice from Dr. Hare, professor of chemistry, respecting the fusion of platina, a new ether, and a series of gaseous compounds formed the elements of water . . 12 (11)
Nutrition of plants. By M. Payen 16 (14)
Nux vomica, case of poisoning by. By R. Dundas Thomson, M.D. . 60

Ointment. *See* Mercurial.
Olive oil, mode of detecting the adulteration of, and oil of sweet almonds, with oil of poppies. By A. Lipowitz 253
Opium and alcohol, comparative effects of 49
———, consumption and trade of, in China . . . 23 (22)
———, smoking. The Mexican plants 23 (22)
———, watery solution of, in venereal excrescences . . . 86
Ophthalmia. *See* Hemlock.
Origin of the mineral dysodil . 270
*Oxides, theory of chlorides of. By M. Milon 45
Oxyhydrogen gas, preparation of. By MM. Hess and Jacobi . . 69
*Oxychlorides with compound radicals, additional note on. By M. Berzelius 35
Oxygen, on the combination of, with atmospheric air forming the binoxide of azote, or nitrous gas, by the transmission of these gases through a porcelain tube heated to bright redness. By Charles Watt . 4

Palm Oil, method of bleaching, and animal and vegetable oils, &c. By Charles Watt . . . 113
Palladium. *See* Copper.
Paper, on the introduction of plaster in the manufacture of, and on the means of detecting this adulteration. By M. Wislin (*See* Chlorine.) . 46

Patent granted to Mr. Moses Poole, for improvements in the manufacture of caustic soda and carbonate of soda. Abstract of specification . 340
Paullinia, a new medical substance 287
Pectine, Pectic acid. Ferments. By M. Fremy . . . 233
———, investigations concerning. By M. Poumaréde . . 79
Pelosine 270
Pepsine. The digestive principle, M. Wasmann on . . . 268
Petroleum oil well . . 303
Phenomena observed concerning carbonic acid submitted to higher pressures than that of the atmosphere. By M. Couërbe . . 103
Phosphoric acid, crystallized, composition of. By M. Peligot . 195
—————, mode of separating iron from . . . 237
Phosphorus, obstacles presented in the employment of, as an eudiometrical means. Action of carburet of sulphur, of creosote, of eupione, and of sulphurous acid on phosphorus. By M. Vogel, jun. . . . 258
Photogenic designs, process for obtaining, on paper. By M. Verignon. 119
——— drawing, a new method of, Dr. Schafhæutl on . . 367
——— drawings, on a process for fixing. By M. Preschtl . 211
———————, Mr. Talbot's, M. Biot on . . . 184
——————— of microscopic objects. By M. Donné . . 119
——— images, process for obtaining, on paper. By M. Bayard 119
——————, on the fixing of. By M. Choiselat . . . 211
——————, fixation of, on metal 187
——— paper for copying drawings and engravings. By M. Becquerel 151
Photography . . 120, 187
————, application of, to meteorology. By M. Hubert . 245
*————, employment of the Drummond light in. By MM. Biot and Donné . . . 45
Photographic images, engraving from. By M. Donné . . . 244
———————, method of fixing. By M. Fizeau . . . 342
———————, to deposit solid voltaic plates, having the lines in relief 371
———————, to raise lines in relief, on a plate of copper or other metal 372
*———————, fixation of colors in. By M. Bianchi . . 45
———————, modification in the preparation of plates for receiving. By M. Séguier . . 150
Photographic images, ioduration of metallic plates for receiving; and on the use of the strips of plates with which it is customary to surround them. By M. Séguier . . 82
———————, use of the strips of plate bordering the sheet for receiving a photographic image, before exposing to the vapor of iodine. By M. Daguerre . . . 81
———————, preparation of a paper for receiving. By M. Lassaigne 150
———————, on the length of time an iodized plate should remain exposed to light, in order to give a good photographic image. By M. Soleil . . . 210
Photographic drawings on silvered paper. By M. Raifé . . 211
Pills, anticephalalgic, of Dr. Broussais, in cases of obstinate headache . 288
Pills, Walch's tonic astringent, in blennorrhæa and leucorrhæa . 255
Pitch in the treatment of hœmorrhoids, Mr. Wardleworth on . . 189
Plaister, Kiceland's drying . 190
Platina. *See* Notice.
*Platinum, application of sponge of, to the preparation of several products. By M. Kuhlmann . . 10
————, memoir of M. Kuhlmann, relative to the properties of particles of, and to the phenomena of etherification . . . 14, (12)
————, on the reduction of, from the chloride of platinum and potassa. By M. Victor Parisot . . 172
————, on a new combination of chloride of, and ammonia, considered as the radical of the salts of Gros. By M. Jules Reiset . . 204
Plisson's, Dr., sedative in cases of neuralgia and chronic rheumatism . 387
Poisoning by aconite . . 122
——— with the extract of aconite 26
——— from the extract of aconite 51
——— by ammonia—remedial measures. By Dr. Alphonso Souchard 346
——— with arsenic . 25, (23)
——— by colchicum seed. By Dr. Neubrandt . . . 188
———, suspicion of, report on that subject . . . 123
——— by concentrated acids, and on the first aid to be administered. By M. A. Chevallier . . 89
——— by essential oil of bitter almonds, observed by Mr. Chavasse 123
———by nightshade berries (*solanum nigrum*) . . . 155
——— by nux vomica. By R. Dundas Thompson, M.D. . . 60
———, statistics of, in England 51
———, statistics of, in Denmark 54

Poisoning of rabbits, produced by sulphate of quinine, administered in a full dose . . . 32, (31)
——— by the sweet pea (*lattyrus odoratus*), treated by oxide of zinc. By M. Puel, of Figeac . . 285
———. *See* Laffarge.
Poisonous Metals. *See* Metals.
Poisonous symptoms from the bite of a spider. By Dr. Hulse . 51
Poisons, on the sale of 217, 246, 283
Polygonum tinctorium, on the coloring matter of the. By M. Colin . 112
———, extraction of indigo from the. By M. Osmin Hervy . 242
———, mode of extracting indigo from the. By MM. Girardin and and Preisser . . . 243
Poppy Wild, drying the petals of the By M. Hunoult Desfontenelles . 125
Porter, on the adulteration of. By Charles Watt . . . 174
Potassa, chlorate of, new mode of preparing. By M. Pelouze . 106
Potassium, on a new compound of ferrocyanide of, with cyanide of mercury. By Robert Kane, M. D. M.R.I.A. . . . 73
———, iodine of, sea salt containing. By M. Bouchardat . 73, (72)
*———, chloriodide of. By M. Filhol 41
Pregnancy, new test for the detection of 32, (30)
Preparation of decoct. aloes. comp. and spiritus ætheris nitrici. By Mr. Bartlett . . . 95
Prizes proposed . . 128, 255
Prostatic calculi, analysis of. By M. Bonnamy . . . 79
Proteïne of the crystalline lens of the eye, M. J. Mulder on the . 300
Prussian blue, preparation of. By Mr. Lewis Thompson . . 20, (19)
Prussic acid, therapeutical action of. By M. Becquerel. . . 91
Purgative decoction, Dr. Degland's, for lead colic . . . 125
*Purpuric acid. By M. Fritzche 10

Quackery, system of, and its evils. Proposed remedy . . 314
Quinic acid—Quinoyl. By M. Woskressensky . . . 236
Quinine. M. Magonty on . 198
——— and its adulterations . 93
———, adulteration of, sulphate of 94
———, sulphate of, poisoning of rabbits by . . . 32, (31)
———. on the action of chlorine on. By M. J. J. André . . 109
———, narcotine, a substitute for 24, (22)
———, sulphate of, new substitute for 157
Quinquina, new species of . 63
———, mode of essaying . 173
Rennet, M. Deschamps on . 229
Remarks on the former uses of purple or scarlet coloring insects.—New cochineal of Persia and Armenia. By M. J. J. Virey . . . 209
——— concerning M. Boutigny's memoir, entitled, "Phenomena of calefaction." By MM. Arago, Pelouze and Robiquet . . 133
——— concerning a memoir by M. Boutin, on the products resulting from the action of nitric acid on the resin of aloes, and their application to dyeing. By MM. Thenard, Robiquet and Pelouze . . 144
——— concerning a memoir by M. Lassaigne, entitled, "Researches on the chemical action which the metallic salts exert on liquid albumen, and on certain tissues of the animal economy. By MM. Robiquet and Pelouze . . . 138
———, extract of, on M. Sequin's memoir, entitled: "Investigations concerning the distillation of animal matters. By MM. Arago, Becquerel, Dumas, &c. . . 174
Re-vaccination. M. Sedillot on 219
Re-vaccinations undertaken in Villingen in 1838 . . . 192
Review of the Transactions of 1839. By M. Vée . . . 65
Rock salt, on the red coloration. By M. Marcel de Serres . 106

Salt at the source of Tourabela in South America. By M. de Paravey 96
Santonine, on the preparation of. By M. Guillemotte . . 187
Saponification of a human corpse . 386
Sarsaparilla and its preparations. By Mr. John Mackay of Edinburgh 344
Sciences, considerations concerning the application of the physico-chemical sciences to the natural sciences, to the arts, and to manufactures. By M. Becquerel . . . 271
*Selenic acid, on the preparation of. By H. Rose . . . 4
Silica, on the solubility of, by steam 332
Soda, caustic, and carbonate of 325, 340
Sodium, chloride of, in scrofula . 94
Snails, observations on. By M. Figuier 158
Spencer, Thos. Instructions for the multiplication of works of art in metal 332
Spermatic animalculæ. Detection of the 58
Statues, copies of, executed by M. Duteil's machine . . . 151
Steel, method of examining, bar iron and cast iron. By M. Berzelius
Stones, new. Importance attached to the selection of a stone for building purposes . . . 339
Storax, liquid. M. Simon on . 196

Stramonium, effects of extract of, in facial neuralgy . . 222
*Strontia, process for isolating carbonate of, from other carbonates . 37
Subjects, on the preservation of, for normal and pathological anatomy, without altering the color or density of the tissues. By Dr. Ch. Dujat 126
Substitutions in chemistry, theory of, proposed. By M. Dumas and M. Berzelius . . . 33
*————, on the law of, and the theory of types . . 69
———— and chemical types, on M. Dumas' theory of. By M. Berzelius 353
Sugar cane, juice of the, results of M. Plagnes' investigations concerning the composition of. Letter from M. Colin . . . 184
—— in the cane, proportions of. By M. Peligot . . . 148
——, artificial preparation of . 305
—— of the cane, action of arsenic acid on. By M. L. Elsner . . 111
*Sulphur, whiteness of precipitated. By M. H. Rose . . 45
Sulpho-sulphuric acid, facts relative to. By Professor Persoz . . 167
*Sulphur, sulphate of chloride of. M. H. Rose on . . . 9
———— in rheumatism . . 190
————, oxidized compounds of. On certain facts relative to. By Professor Persoz . . . 165
*Sulphuretted hydrogen, action on some salts of potash. By M. H. Rose 39
*Sulphuric acid, formation of. By M. H. Rose . . . 45
———— acid, new process for making. By M. Provostaye . 306
———— acid, on the tests for, when thrown on the person. By R. D. Thomson, M.D. . . 349
Sulphurous waters, new method of analysing.—Iodine as a test for hydro-sulphuric acid. Sulpho-hydrometer. By M. Alphonse Dupasquier 330
Sympathetic inks . . 280
Syria, an animal tinctorial powder. By M. J. J. Virey 156
Syrups, observations on. By M. Guibourt 63

Tarragon and savine, on the essences of, on cinnhydramide and on bromide of camphor. By M. Laurent 171
Tartar, stibial. M. Orfila on . 153
Tartaric acid. Observations concerning. By M. Berzelius . . 130
——— acid. Contributions to the history of. By MM. Soubeiran and Capitaine . . . 72, (71)
*Telegraph, galvanic, of M. Steinheil, notice on the . . . 33
Telegraph, electro-magnetic. By Mr. Morse . . . 43
"Ticketing." *See* Druggists.
Tetanus, new remedy for, and other convulsive disorders. By W. B. O'Shaughnessy, M.D., Calcutta 248
Titanium, on the formation and preparation of blue oxide of in the dry way, and on the cause of the blue color of many scoriæ from high furnaces. By Ch. Kersten, of Freiberg . 362
Tobacco, death from eating . 352
Tormentilla, on the employment of, in medicine. By M. Morin . 231
Toxicological mistakes . . 57
Turpentine, essence of, new investigations concerning. By M. Deville 324
————, on the essence of, and artificial camphor. By MM. Soubeiran and Capitaine . . 76
Types, chemical. *See* Substitutions.

Urea, pre-existence of, in uric acid 329
*Uric acid . . . 96
Uvularia perfoliata, an antidote for poisoned wounds. By B. H. Coates, M.D. 56

Vaccine matter . . . 89
———— lymph, transmission of. By the penny post . . 59
Vaccination, correct, and impediments thereto . . . 86
———— report, presented to both houses of parliament, by the National Vaccine Establishment . 120
Varnish. *See* Linseed oil.
Variola, inoculation of a leper with. By M. Guyon . . . 59
Vegetable alkalies, on the means of distinguishing, by chlorine, and by the sulphocyanide of potassium. By M. Lepage . . . 140
———— preparations, new method of obtaining the more powerful. By Mr. E. Bentley, Moorgate . 315
Verdigris, on the property of removing, possessed by a double chloride of zinc and ammonia. By M. Golfier, Besseyre . . . 34
Violets, syrup of. By M. Poitevin 352
*Voltaic combinations, on the employment of carbon in. By Mr. John Thomas Cooper . . 70
———— electricity, restoration after drowning, by the action of, on the phrenic and eighth pair. By Dr. Ferguson, surgeon to the Westmeath infirmary . . . 286

Water, on the precipitation of certain metallic oxides. By H. Rose 234

Waters, on drinkable and natural, and on the influence of their purity in dyeing. By M. Dupasquier . 146
Waterproofing liquid, examination of a. By Mr. E. Bentley. . . 302
Waterproof soap. Report concerning. By M. Robiquet . . 115
Wieliczka, decrepitating salt of . 198
Wood, on the preservation of, &c. By M. Boucherie . . . 205
Wool. *See* Dyeing.
Writing fluid, new. By Charles Thornton Couthupe, Esq. . . 173
Writing on parchment.—Falsification.—Report on that subject. By M. J. B. Chevallier . . . 118

Zinc, sulphate of, as a vomitive. By M. Toulmonche . . 286
——, new process of zincing copper and iron . . . 370
——, sulphate of, frequent and weak injections with, in gonorrhœa . 121

ERRATA.

Page	Col.	Line
15	2	15 from bottom (p. 14, c. 2, l. 9 from top), *for* "capsule in platinum," *read* "capsule of platinum."
17	2	21 from bottom (p. 16, c. 2, l. 4 from top), *dele* "carbonised."
17	2	9 from bottom (p. 16, c. 2, l. 16 from top), *for* "arsenic" *read* "acid."
*33	2	11 from bottom *for* "$C^4 H^6 O^3$," &c. *read* "$C^4 Cl^6 O^3$," &c.
41	2	17, before "exist"—insert "not."
77	1	19 from bottom, *for* "evils," *read* "oils."
89	2	33, *for* "alkalies"—*read* "acids."
93	2	20 from bottom, *for* "Saline Helise," *read* "Salix Helix," and, following line, *for* "Saliniæ, *read* "Salicine,"
116	1	15, *for* "blue, *read* "green."
116	2	25 from bottom, *for* "matter," *read* "color."
141	1	25, *for* "distilled," *read* "dissolved."
211	2	25, *for* "iodide," *read* "iodine."
288	1	10 from bottom, *for* "ā ā gram. 0·00," *read* "ā ā gram. 0·50."
338	1	26, *after* "quantity of." *insert* "hot water."
339	2	11, *after* "poet," *insert* "Αριστον μὲν ὕδωρ."
342	1	13, *for* "sulphate," *read* "sulphite."
344	1	4, *for* "Serum," *read* "Sevum."
345	2	15, *for* "Sacc. Elycynh.," *read* "Succ. Glycyrrh."
345	2	15, *for* "Elycynh. pin," *read* "Glycyrrhpur."

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